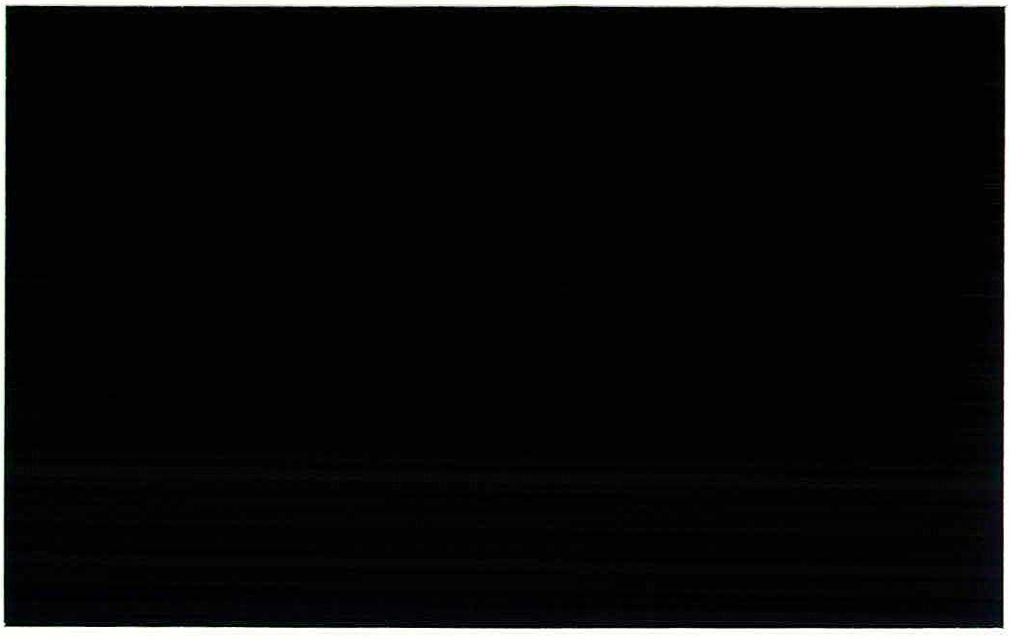
1990/002

Institute of Hydrology



Natural Environment Research Council

Wallingford Meteorological Station Report 1990

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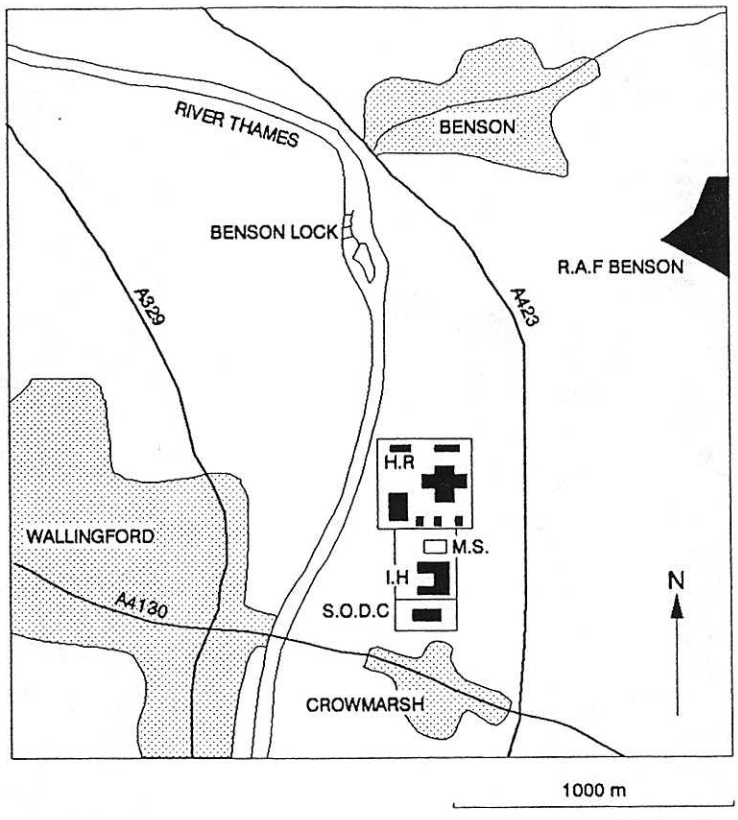
Contents

1. Introduction

The Meteorological Station commenced operation at Wallingford in 1962 and meteorological data has been submitted to the Meteorological Office since 1966. The station also acts as an experimental site for projects at the Institute of Hydrology and for outside bodies. The station is maintained seven days a week by staff of the Catchment Water Balance Section at the Institute and the location of the site is shown in Figure 1.

FIGURE 1. LOCATION OF WALLINGFORD METEOROLOGICAL SITE



URBAN AREA

MAIN BUILDINGS

A-CLASS RAOD

B-CLASS ROAD

H.R.	HYDRAULICS RESEARCH LTD
I.H.	INSTITUTE OF HYDROLOGY
S.O.D.C.	SOUTH OXFORD DISTRICT COUNCIL
M.S.	METEROLOGICAL SITE

The second annual report of the Wallingford Meteorological Station aims to examine the relationship of the 1990 data to the long term data. This report differs from the first annual report in that it includes a section on evaporation and a comparison of manual and AWS data for the year.

2. Data collection, storage and analysis

The data collection and storage procedures at the Wallingford site were outlined in the Wallingford Meteorological Station Report 1989 (Hughes, 1990). The most significant development in the past year has been the establishment of a hydrometeorological database containing historical daily data from the Wallingford and Moel Cynnedd stations (Plynlimon, Mid Wales). Details of the development and contents of this database are summarised in Hughes (1991).

Following morning observation, data are entered onto an IBM Mainframe file after manual quality control checks by Catchment Water Balance section staff. The database is currently updated at the end of each month using the data loading facilities of the ORACLE Relational Database Management System.

A program has been written to produce monthly summary sheets of the data in a format similar to the MET. 3208B forms normally submitted to the Meteorological Office at Bracknell. This program has therefore removed the requirements to complete the form manually and also allows rapid retrieval of data for any month in the operational history of the station(s). These monthly summary sheets are now submitted to the Met. Office instead of the 3208B forms and should the Met. Office make any quality control changes to the data the database maybe updated accordingly.

In addition to the manually collected data, the Automatic Weather Station (AWS) at the site is downloaded every week and used to provide various meteorological data and an estimate of Penman Evapotranspiration (see section 4.1.5.2). The AWS data are used for the purpose of quality control checks on the manual observations and in several other research applications within the Institute. Details of the data collection, quality control and storage of AWS data are provided in Roberts (1989).

Several users of the meteorological data have been identified in a user survey which is reported in Hughes (1991). During 1990, several short research projects were initiated including a comparison of air and grass minimum temperatures at Wallingford (Pearson, 1991) and an analysis of spatial and temporal rainfall variation in South Oxfordshire is currently under investigation. Both projects have utilised the ORACLE database table METDATA which has facilitated rapid analysis and access to a large dataset previously requiring a considerable time consuming effort in the manual collation of data from historical forms.

Given the increasing interest now being shown in high quality meteorological datasets (Price-Budgen, 1990), the need to make users aware of any assumptions, limitations etc. of the dataset is vital. "Database compilers should make available a complete, detailed factual account of the procedures, rationale, testing, assumptions and known problems involved in the creation of a dataset. In essence, the compiler should scrutinize his own database and make his scrutiny available to the user" (Gultman, 1991). In terms of the Wallingford Meteorological data, a detailed investigation of the database is to be a major requirement of the forthcoming year. To assist users of the 1990 data however, a log of any significant changes and instrumentation on the site has been complied for the year and is presented in Appendix A.

3. Annual summary of weather at Wallingford in 1990

The weather at Wallingford in 1990 gave rise to a number of extreme values which are discussed in greater detail in later sections. Table 3.1 presents annual data collected at Wallingford in 1990 in relation to the long-term average.

Table 3.1 Annual summary of weather at Wallingford in 1990

	1990	LTA (1962-89)	ANOMALY
TOTAL RAINFALL (mm)	453.6	584.1	-23.4%
TOTAL SUNSHINE (hrs)	1716.9	1427.5	+20.3%
MEAN AIR TEMPERATURE (°C)	10.8	9.5	+13.7%
MEAN WIND SPEED (KNOTS)	4.0	3.9	+ 2.6%

Temperature and sunshine were well above average for the year, and in annual terms, these averages and totals represent the warmest and sunniest year on record at the site. The annual rainfall total represents the fourth driest year on record at Wallingford, but the mean annual wind speed was not exceptional (Fig. 3a-d).

In summary, 1990 was a mild and dry year despite the third wettest January and wettest February at Wallingford since records began in 1962. February 1990 was also extremely windy at the end of the month with gales across the country causing structural damage in several places (including IH!). May was an exceptionally dry month at Wallingford with only 2.1 mm of rainfall, the lowest amount recorded in any month at Wallingford. August 1990 was dominated by the extremely hot temperatures recorded at the beginning of the month, including the highest temperature recorded at the station (35.1°C on 3/8/90). November 1990 was the driest November on record at Wallingford and December saw the first measurable snow at the station for over 2 years.

FIG 3a WALLINGFORD ANNUAL MEAN TEMPERATURE 1962-1990

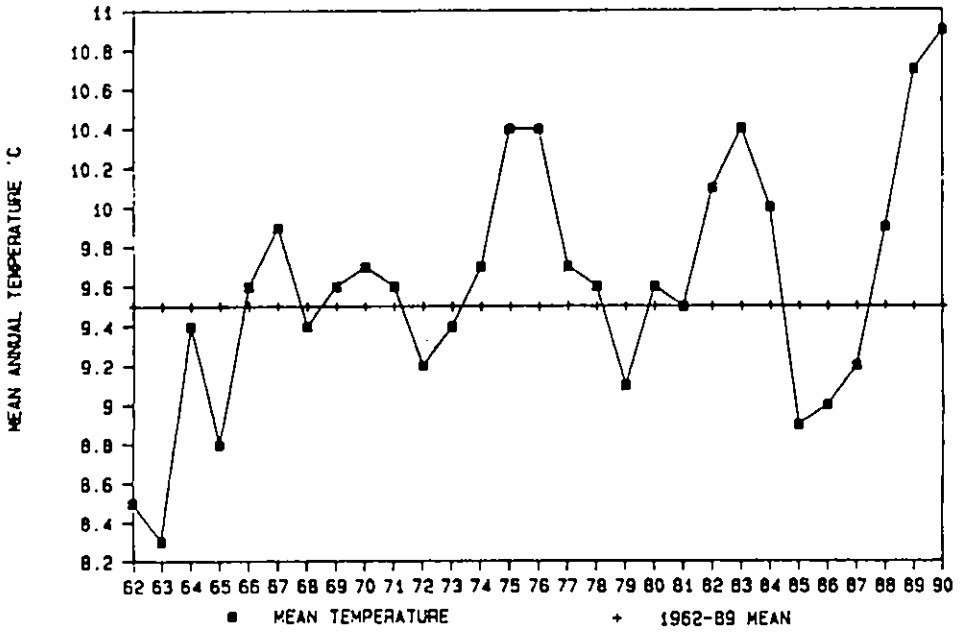


FIG 3b WALLINGFORD ANNUAL RAINFALL 1962-1990

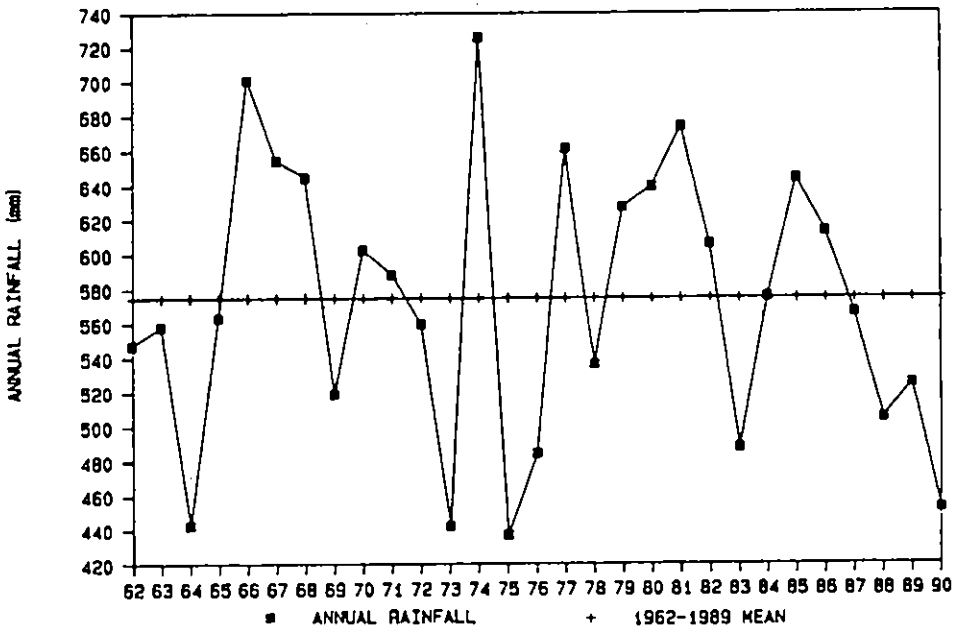


FIG 3c WALLINGFORD ANNUAL MEAN WIND 1962-1990

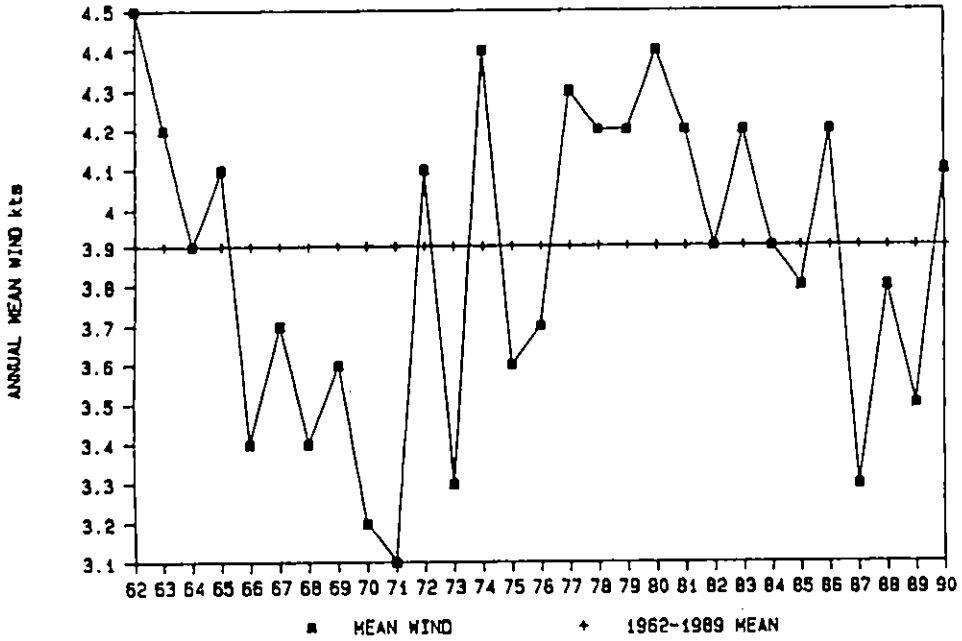
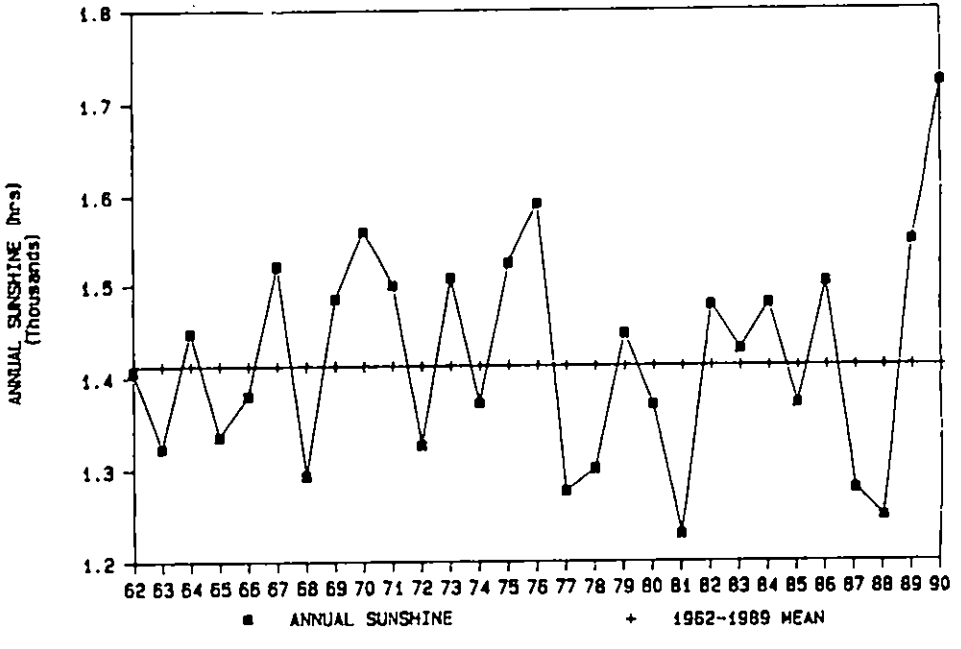


FIG 3d WALLINGFORD ANNUAL SUNSHINE 1962-1990



4. Meteorological data analysis

4.1 DATA SUMMARY

4.1.1 Precipitation

Total rainfall at Wallingford during 1990 was 453.6 mm, the third lowest annual rainfall at the station since records started in 1962. Only January and February had above average monthly rainfall (Fig. 4a) and the cumulative rainfall in these two months amounted to 39.7% of the annual total, giving one of the wettest starts to any year at Wallingford. The daily total of 18.6 mm on 1 February 1990 was the highest February daily rainfall total record at the site.

Table 4.1 Rainfall statistics for Wallingford in 1990

Month	Total Rainfall (STD) mm	1962-89 Average (mm)	Highest Monthly Total (mm)	Lowest Monthly Total (mm)	Greatest Fall in 24 Hours (1990)	Total Rainfall (GL) mm
January	77.0	49.8	100.3 (88)	11.4 (87)	12.0 (6th)	82.9
February	103.3	32.1	103.3 (90)	6.3 (65)	18.6 (1st)	110.7
March	18.9	45.8	97.2 (79)	8.3 (73)	14.0 (19th)	19.9
April	23.4	40.2	98.7 (83)	3.3 (84)	6.6 (2nd)	25.3
May	2.1	52.4	110.9 (79)	2.1 (90)	1.0 (14th)	2.5
June	40.1	51.9	134.3 (71)	2.5 (62)	7.8 (21st)	42.5
July	9.6	43.3	91.7 (80)	9.6 (90)	3.3 (3rd)	10.5
August	31.9	56.2	163.6 (77)	11.5 (64)	12.7 (18th)	33.4
September	28.3	49.6	122.7 (74)	5.5 (71)	11.9 (29th)	30.5
October	46.7	51.6	150.1 (66)	2.5 (69)	13.7 (25th)	49.6
November	20.6	53.5	131.8 (70)	20.6 (90)	6.6 (23rd)	22.7
December	51.7	57.7	131.2 (89)	8.0 (88)	10.1 (9th)	57.7
TOTAL	453.6					488.2

Number of days with Rainfall > 0.2mm = 129
Number of days with Rainfall > 1.0mm = 92
Number of days with Rainfall > 5.0mm = 31
Largest period of rain = 8 days (27.1.90 - 3.2.90)
Largest period without rain = 22 days (7.7.90 - 28.7.90)

Table 4.1 shows that in 1990 May, July and November were the driest of those respective months at the site, and that February 1990 was the wettest February on record. The ground level gauge at Wallingford measured an

FIG 4a MONTHLY RAINFALL AT WALLINGFORD 1990

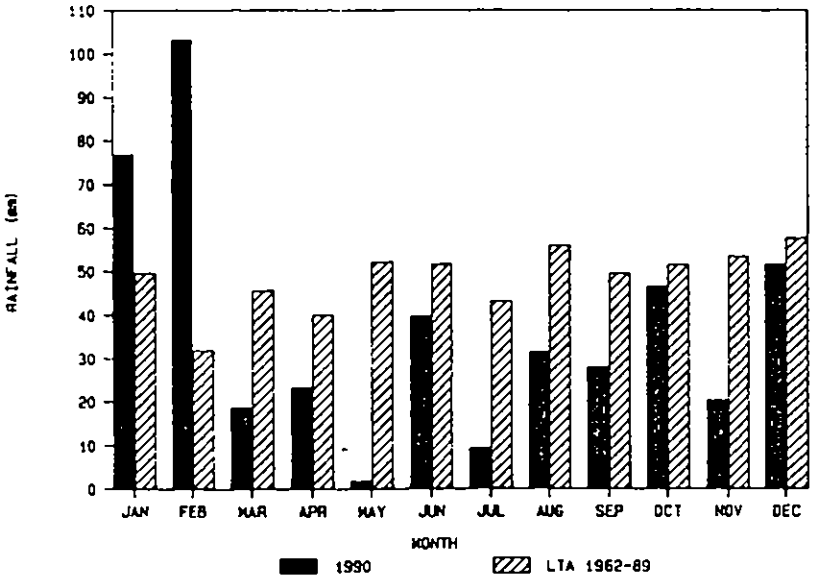


FIG 4b CUMULATIVE RAINFALL AT WALLINGFORD 1990

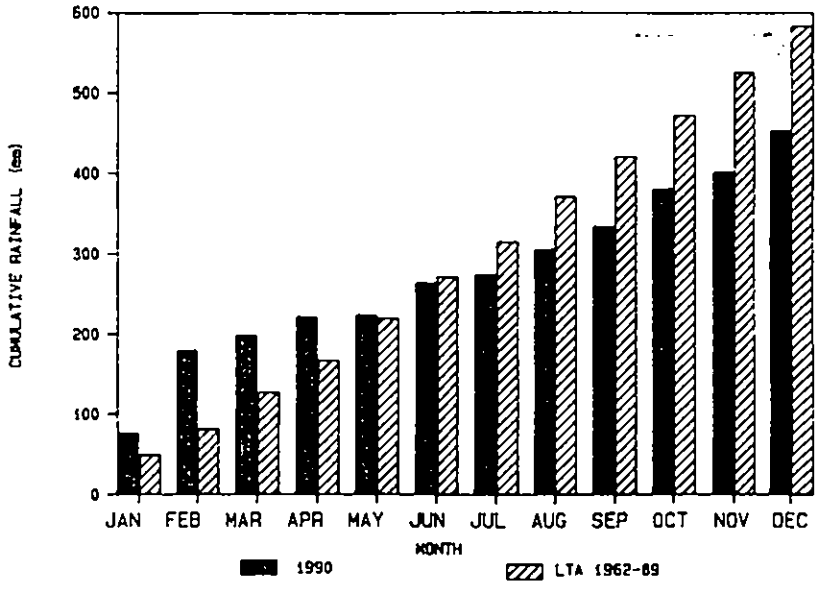
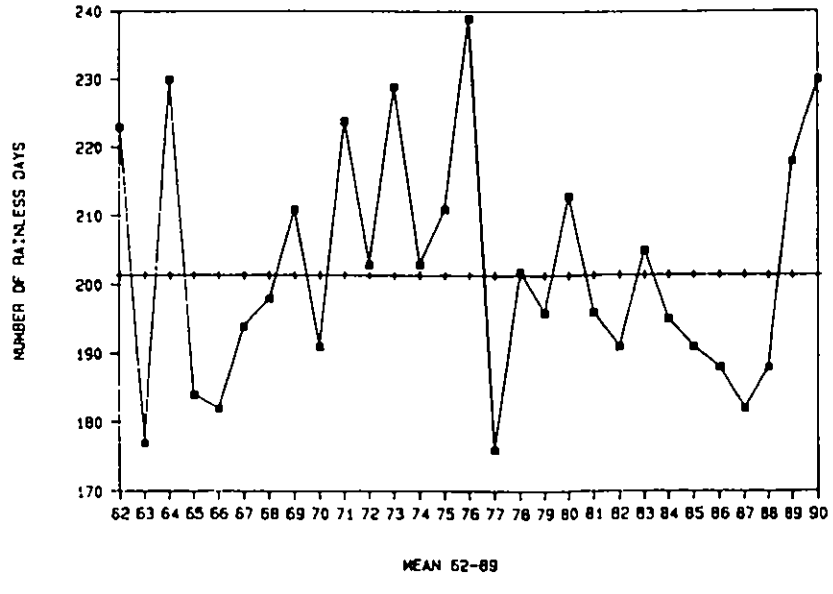


FIG 4c WALLINGFORD ANNUAL NUMBER OF RAINLESS DAYS 1962-1990



annual rainfall total 7.6% higher than the standard gauge. The aerodynamic 10" cone gauge measured 98.2% of the ground level gauge and 106% of the standard collector. Snow was observed on two days during December 1990, although not enough to record snow depth or water equivalent. Figure 4c shows that the number of rainless days at Wallingford in 1990 was the joint second highest number of such days occurring in any single year since 1962.

4.1.2 Sunshine and solar radiation

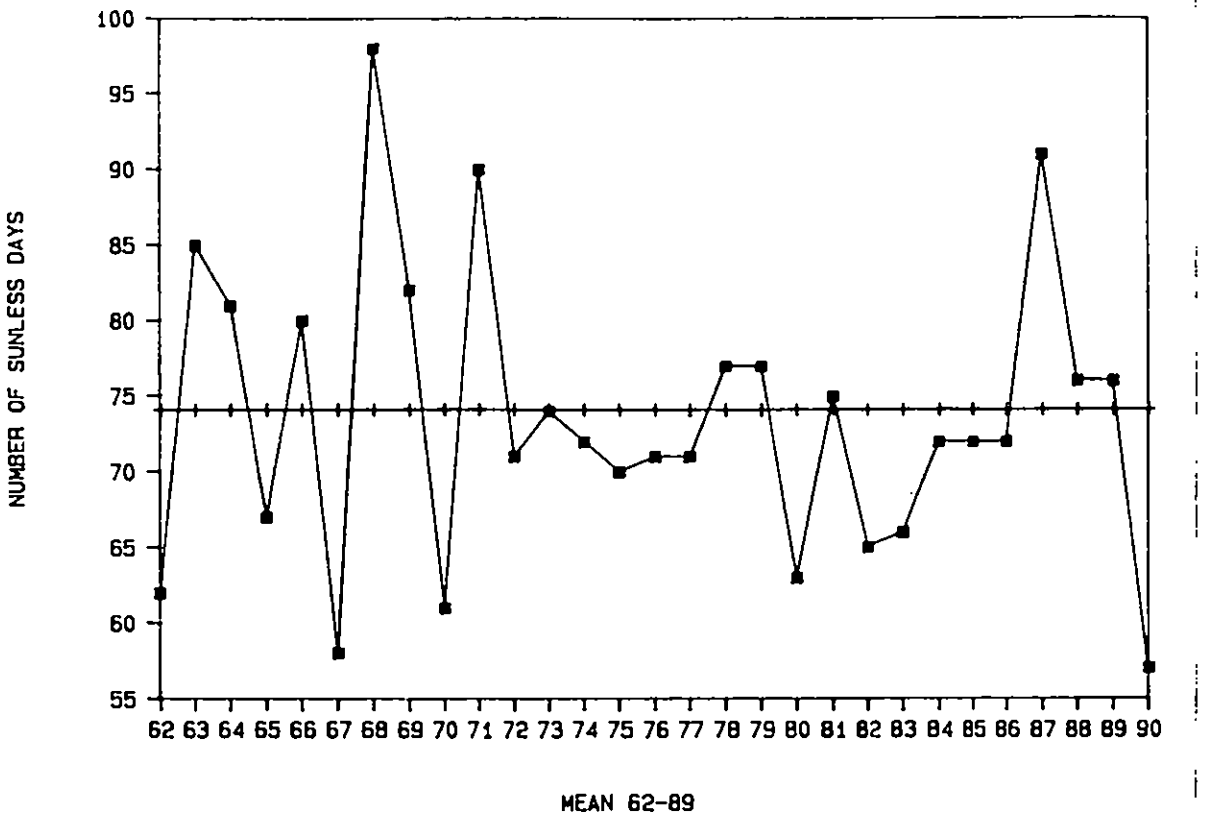
A summary of sunshine and solar radiation data collected during 1990 is provided in Table 4.2. Sunshine is measured by a Campbell Stokes recorder and solar radiation by a Kipp Solarmeter on the AWS. Very few operational problems were experienced with the sunshine recorder during 1990, but 2 days data were lost in June and were subsequently estimated from Meteorological Office areal computer checks. Meteorological Office Inspectors have commented that due to the horizon around the station, sunshine at the site is probably being underestimated and that the percentage loss of sunshine is increasing. To overcome this error, the instrument pillar is to be raised by approximately 1 metre.

Table 4.2 Sunshine and solar radiation statistics for Wallingford during 1990

	Total Hours	LTA	Mean Daily	Max Daily	Total Solar Radiation (cal/cm^2)	LTA (1963-86)
JAN	54.8	47.4	1.76	7.2(18th)	1669	1738
FEB	102.6	66.5	3.66	9.1(12th)	3148	2879
MAR	137.5	105.0	4.43	9.9(31st)	6822	5746
APR	213.5	143.5	7.12	12.6(30th)	12369	8749
MAY	261.2	180.2	8.43	13.8(24/26th)	14276	11448
JUN	94.5	191.2	3.15	11.1(4th)	10241	12611
JUL	236.7	185.0	7.64	15.5(11th)	13463	12268
AUG	227.4	173.2	7.33	12.4(2nd)	11417	9927
SEP	160.9	137.4	5.4	10.4(9th)	7554	7146
OCT	113.6	98.2	3.66	9.3(12th)	4313	4352
NOV	78.6	62.4	2.62	8.4(1st)	2211	2248
DEC	35.6	37.5	1.15	5.3(5th)	1236	1375
TOTAL	1716.9				88719	80487

Despite the potential loss of sunshine hours, the total measured hours during 1990 represents the sunniest year on record at the site, and this is reflected in Figure 4d which illustrates that 1990 recorded the least number of sunless

FIG 4d WALLINGFORD ANNUAL NUMBER OF SUNLESS DAYS 1962-1990



days in any year at the station. The total sunshine in January was the highest total measured in that month for 10 years at Wallingford, and it was the second sunniest February at the site. March and April sunshine was well above average and May was the sunniest May on record at Wallingford. Total sunshine for June was well below average and this is also shown in the solar radiation total for the month. The total sunshine for July was similar to that in 1989 (237.5 hrs) and it was the second sunniest August at Wallingford. Sunshine remained above average during the next three months but fell slightly below the mean in December.

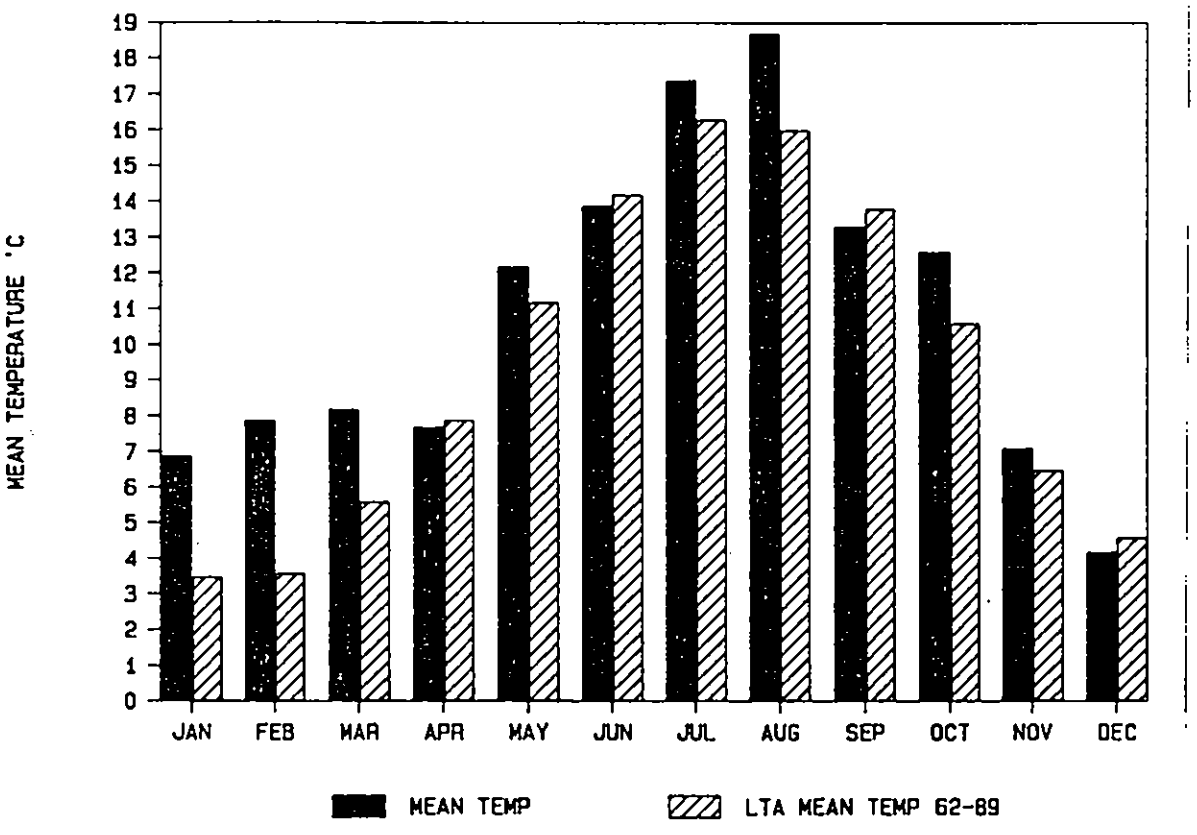
The solar radiation total for the year was 110% of the 1963-86 mean but only 0.5% more than the 1989 total (88252 Cal/cm^2). This compares to the total sunshine in 1990 which was 112% of the 1989 total.

4.1.3 Temperature

4.1.3.1 Air Temperature

Table 4.1.3 presents air temperature data from Wallingford during 1990. Despite 1990 being the warmest year at Wallingford since records began in 1962, there were 4 months when the mean monthly temperatures were below the long term average. (Figure 4e).

FIG 4e WALLINGFORD MEAN TEMPERATURE 1990



July and August 1990 were particularly hot months and on 3rd August 1990, a temperature of 35.1°C was recorded, the highest temperature at Wallingford since records began in 1962. February, April and May also had temperatures higher than previous maximum temperatures for their particular months, whereas July experienced the lowest temperature recorded during July since records began, 2.0°C.

Table 4.3 Air temperatures at Wallingford during 1990

	ABSOLUTE MAX (°C)	1962-90 EXTREME MAX (°C)	MEAN MAX (°C)	1962-89 MEAN MAX (°C)	ABSOLUTE MIN (°C)	1962-90 EXTREME MIN (°C)	MEAN MIN (°C)	1969-89 MEAN MIN (°C)	MEAN TEMP (°C)	1962-89 MEAN TEMP (°C)
JANUARY	12.8	13.7(15/75)	10.1	6.5	-2.4	-21.0(14/82)	3.6	0.5	6.8	3.5
FEBRUARY	16.3	16.3(23/90)	11.3	7.0	-1.0	-13.2(13/85)	4.5	0.2	7.9	3.6
MARCH	21.0	22.2(29/65)	12.9	9.7	-4.4	-11.1(7/71)	3.4	1.5	8.3	5.6
APRIL	23.0	23.0(30/90)	13.9	12.6	-6.1	-6.4(3/84)	1.5	3.2	7.7	7.9
MAY	27.5	27.5(3/90)	19.5	16.2	0.1	-3.4(9/80)	4.9	6.1	12.2	11.2
JUNE	23.9	33.9(27/76)	18.4	19.5	3.4	-2.2(1/62)	9.3	8.9	13.9	14.2
JULY	32.1	33.3(3/76)	24.2	21.6	2.0	2.0(3/90)	10.6	10.9	17.3	16.3
AUGUST	35.1	35.1(3/90)	25.3	21.1	5.9	1.1(30/64)	12.1	10.8	18.7	16.0
SEPTEMBER	24.7	29.1(5/73)	19.0	18.5	0.6	-2.8(30/69)	7.5	9.0	13.3	13.8
OCTOBER	23.4	26.7(1/85)	16.3	14.7	-1.6	-4.5(30/83)	8.9	6.5	12.6	10.6
NOVEMBER	16.0	17.8(2/69)	10.4	10.0	-2.1	-8.5(26/89)	3.7	2.9	7.1	6.5
DECEMBER	12.9	15.2(2/85)	6.9	7.7	-3.2	-17.3(13/81)	1.5	1.4	4.2	4.6

4.1.3.2 Grass Temperature

	J	F	M	A	M	J	J	A	S	O	N	D
Absolute Minimum	-4.7	-3.4	-8.9	-11.3	-6.0	-3.6	-5.0	1.0	-3.4	-6.7	-6.2	-7.9
No Days < O°C	14	7	16	24	19	7	4		9	6	19	19

There were 144 ground frosts at Wallingford during 1990, and August was the only month free of ground frosts. April had the greatest number of ground frosts and was also a month with mean air temperature below average. The lowest grass minimum of -11.3°C in April was one of the lowest grass minimum temperatures recorded at Wallingford during April, only -11.5°C during April 1976 being lower.

4.1.3.3 Soil Temperature

The soil temperatures at 5 depths at Wallingford in 1990 are presented in Table 4.4.

Table 4.4 Soil temperatures at Wallingford during 1990

	DEPTH (cm) 10	20	30	50***	100**	MEAN	MEAN 62-89*
JANUARY	5.4	5.3	6.6	7.1	7.8	6.4	5.5
FEBRUARY	5.6	5.4	6.9	7.3	7.7	6.6	5.1
MARCH	6.2	6.1	7.9	8.2	8.3	7.3	6.6
APRIL	7.2	7.4	8.9	9.2	9.1	8.4	8.2
MAY	14.0	14.1	13.7	13.2	11.9	13.4	12.6
JUNE	14.9	14.9	14.9	14.4	13.3	14.5	14.7
JULY	17.7	17.7	17.1	16.2	14.6	16.7	17.0
AUGUST	18.2	18.4	18.3	17.4	15.8	17.6	16.7
SEPTEMBER	13.2	14.4	14.8	14.9	14.5	14.4	14.6
OCTOBER	10.6	11.7	12.7	12.9	13.2	12.2	12.0
NOVEMBER	6.3	7.3	8.7	9.5	10.7	8.5	8.2
DECEMBER	3.8	4.5	5.5	6.5	7.9	5.6	6.0
MEAN	10.3	10.6	11.3	11.4	11.2		
MEAN 62-89*	10.2	10.4	10.4	11.4	10.5		

Note * MEAN 62-89 applies to 30 cm and 100 cm only, 10 cm, 20 cm and 50 cm thermometers from 1989.
** Missing data, 2 days
*** Missing data, 40 days

The mean soil temperatures at Wallingford for 1990 were above average for all months except June, July, September and December. The significant increase in temperatures from April to May is, as in the previous year, immediately apparent and this corresponds to the exceptionally dry and warm weather experienced in May.

The mean temperatures at each depth during 1990 were all above the average temperatures for the soil depth.

4.1.4 Wind speed

The main feature of the wind at Wallingford in 1990 was the incidence of storms in late January and late February which caused structural damage in many parts of the country. The peak average hourly wind speed during these events was 28.8 knots on 25th January 1990, and the maximum average 24 hour wind speed was 14.4 knots on 26th February 1990.

The average annual wind speed was 103% of the average and the average monthly wind speed was exceeded in 3 months of the year (Table 4.5).

Table 4.5 Wind speed data for Wallingford 1990 (N.B. manual anemometer readings corrected to 10 m)

MONTH	MEAN WIND KNOTS	LTA KNOTS	MAX 24 HOUR KNOTS	MEAN WIND 1989 KNOTS
JANUARY	5.8	4.3	13.9	3.5
FEBRUARY	7.8	4.3	14.4	5.1
MARCH	4.8	4.8	8.3	5.1
APRIL	4.1	4.3	8.0	3.6
MAY	2.4	4.0	5.2	2.9
JUNE	3.2	3.5	6.9	2.8
JULY	3.1	3.3	8.7	2.7
AUGUST	2.9	3.3	6.9	3.3
SEPTEMBER	2.9	3.4	7.7	3.0
OCTOBER	4.4	3.3	4.4	3.7
NOVEMBER	3.2	3.8	10.5	2.3
DECEMBER	3.2	4.2	11.5	3.6
MEAN	3.983	3.875	14.4(max)	3.467

The mean annual wind speed in 1990 was 115% of the corresponding figure in 1989 but this was largely due to the winds in January and February 1990, which were 165% an 153% respectively of the mean figures for the corresponding months in the previous year. In contrast the mean wind speed in May 1990 was the lowest mean wind measured at Wallingford during that month, the previous lowest mean wind being recorded in May 1989.

4.1.5 Evaporation

4.1.5.1 AWS Data

Table 4.6 presents Penman evapotranspiration for short grass from the Wallingford AWS during 1990 together with the data for 1989. Since 1989, the AWS data has been collected using a Campbell Scientific Data Logger and this has considerably enhanced the data capture and estimate of PE on the site. Although PE was nearly 9% higher in 1990 than the previous year, PE during the period May - August in 1989 was 7.5% higher than the corresponding period a year later. In contrast, in the periods on either side of these summer months, PE in 1990 was 156% higher in January - April and 119% higher in September - December than the respective 1989 data.

Table 4.6 Penman Evapotranspiration (mm) at Wallingford during 1989 and 1990

	1990	1989
JANUARY	15.0	11.7
FEBRUARY	31.2	19.4
MARCH	51.1	36.7
APRIL	81.6	46.7
MAY	94.6	95.1
JUNE	77.1	101.2
JULY	115.5	119.3
AUGUST	99.0	99.5
SEPTEMBER	61.5	55.6
OCTOBER	37.9	31.7
NOVEMBER	15.8	10.8
DECEMBER	11.0	8.3
TOTAL	691.3	636.0

4.1.5.2 Tank measurements

Table 4.7 presents monthly evaporation data derived from tank measurements at the Wallingford site during 1990. Data for 1989 are presented for comparative purposes together with a record of the data capture in both years.

Table 4.7 Tank Measurements at Wallingford during 1989 and 1990

	1990		1989	
	EVAPORATION (mm)	NO DAYS OBSERVATION	EVAPORATION (mm)	NO DAYS OBSERVATION
JANUARY	20.11	28	24.82	31
FEBRUARY	30.31	23	18.65	22
MARCH	29.55	28	16.93	13
APRIL	54.10	29	40.66	20
MAY	87.72	30	70.93	27
JUNE		0	64.01	21
JULY		0	74.73	20
AUGUST	81.99	28	89.88	28
SEPTEMBER	9.48	5	38.01	22
OCTOBER	11.10	11	13.22	15
NOVEMBER	15.77	31	11.61	23
DECEMBER	11.90	24	12.28	22
TOTAL	352.02	237	475.72	264

The percentage data capture in each year was not high (64.9% in 1990 and 72.3% in 1989), the main reason for this being maintenance work, and problems of topping-up the tank in summer as the hosepipe facilities were removed from the site during the summer of 1990. Also, although tank observations can be obtained during frozen conditions, the ice is not always possible to break up to enable an accurate measurement to be taken. This factor explains the loss of data during winter months.

4.2 COMPARISON WITH AWS

During 1990, two full days AWS data were lost, 22 January and 29 October. The overall percentage data capture for the year was therefore 99.5%. Table 4.8 compares the manual and AWS variables on a monthly basis

Table 4.8 Comparison of Manual and AWS Data

	MEAN TEMPERATURE °C			MEAN TEMP DEPRESSION °C			MEAN WIND SPEED m/s			TOTAL RAINFALL mm		
Month	AWS	Man	Diff	AWS	Man	Diff	AWS	Man	Diff	AWS	Man	Diff (%)
JAN	6.74	6.82	-0.08	1.01	0.93	0.08	2.81	2.97	-0.16	84.5	77	+10
FEB	7.68	7.89	-0.21	1.66	1.20	0.46	3.67	4.06	-0.39	122.5	103.3	+19
MAR	7.94	8.33	-0.39	1.89	1.62	0.27	2.44	2.45	-0.01	21.0	18.9	+11
APR	10.0	7.68	2.32	2.79	2.16	0.63	1.43	2.14	-0.71	11.0	23.4	-53
MAY	12.63	12.16	0.47	3.09	2.81	0.28	1.19	1.24	-0.05	2.5	2.1	+19
JUN	13.87	13.85	0.02	2.43	2.90	-0.47	1.70	1.64	0.06	47.5	40.1	+18
JUL	17.46	17.34	0.12	4.12	4.02	0.10	1.96	1.60	0.36	11.0	9.6	+15
AUG	18.62	18.66	-0.04	3.77	3.70	0.07	1.44	1.48	-0.04	38.0	31.9	+19
SEP	13.05	13.26	-0.19	2.78	2.31	0.47	1.37	1.50	-0.13	35.5	28.3	+25
OCT	12.42	12.58	-0.16	1.92	1.60	0.32	1.96	2.48	-0.52	52.0	46.7	+11
NOV	6.80	7.11	-0.31	1.01	0.73	0.28	1.51	1.66	-0.15	28.0	20.6	+36
DEC	3.92	4.24	-0.32	0.99	0.72	0.27	1.97	2.21	-0.24	67.0	51.7	+30
TOT/AV	10.93	10.83	0.10	2.29	2.06	0.23	1.95	2.12	-0.17	520.5	453.6	+15

In general, there is a close agreement in the mean temperature, temperature depression and wind speed measured by both methods. The total rainfall recorded by the AWS was however 115% of the standard raingauge, this large difference, probably the result of the error produced by the tipping bucket calibration of 0.5 mm in the AWS raingauge. The AWS rainfall total for April is an underestimate as the gauge did not record any rain on seven days. This problem does not apply to the other AWS variables.

5. Future developments

An extensive quality control of the historical Wallingford data should be undertaken during the forthcoming year. This includes the addition to the database of data which has not yet been loaded i.e. Dry/Wet bulb pre 1972 and Soil 10, 20 and 50 pre 1989. The database has already given advantages by allowing more detailed and cost effective analysis to take place, and the accuracy of the data is vital.

The Campbell Stokes sunshine recorder needs to be raised to allow the sunlight at sunrise and sunset to make a trace. At the moment the horizon is obscured by trees and buildings, which means the total sunshine hours are underestimated. Raising the recorder will not solve this problem completely but would improve the estimation of sunshine hours..

It is also hoped to encourage staff at and outside of the Institute of Hydrology to make more use of the data. An example of this is a possible collaboration with Oxford University on a rainfall study.

An additional development should be the enhancement of the commercial potential of the database with further sales of data to farmers and environmental consultants. There still remains, however, considerable scope for research using the database and the re-establishment of a long term manual Penman Evapotranspiration daily series is a priority in this report.

Finally, it is envisaged that the data sent to the Meteorological Office each month will be sent on disc, speeding the process further.

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Roberts, A.M. 1989. The Catchment Research Database at the Institute of Hydrology. IH Report 106.

Acknowledgements

METEOROLOGICAL OBSERVERS IN 1990

J R Blackie
C W O Eeles
C Hughes
A Matthews
M Pearson
A M Roberts
T K M Simpson
K Burton

Appendix A

NEW INSTRUMENTS AND OTHER SITE REMARKS DURING 1990

New instruments

- New Stevenson Screen installed in September
- New funnel placed on standard raingauge in December
- New 10 cm/20 cm thermometers installed in spring

Remarks

- Bare earth patch enlarged to 2 m square in July
- Copy of Meteorological Office Inspectors Report attached.

The Met Office

Observation Provision Branch

Room T11, Eastern Road, Bracknell, Berks RG12 2UR

Tel: 0344 855907 Docfax: 0344 485501 Telex: 0344 849801

Our Ref:D/Met O1/16/7/418

Date: 11 June 1990

The Director
The Institute of Hydrology
Maclean Buildings
Crowmarsh Gillord
Wallingford
Oxon OX10 8BB

Dear Mr Hughes,

I write following the visit of George Spence and I to your Climatological station on 31 May 1990.

You will be pleased to hear that the Station was found to be in very good condition, with the site and instruments being well looked after by you and your observers.

There are however a few recommendations that I would like to make:-

a. The large Elder bush to the ESE of the sunshine recorder requires to be lopped.

b. The Tube Collars of the 30,50,and 100cm Soil Thermometers are between 5 and 8 cm above ground level. The Collars should be at ground level. Replacement caps for the 50 and 100cm will shortly be sent from our stores.

c. The percentage loss of sunshine is increasing and it is suggested that the pillar be raised to 7 feet or a roof site be obtained.

d. Two louvers on the back of the Thermometer Screen are broken. You indicated that it could be arranged to have them repaired locally. The paint on the Screen was flaking in places and requires to be stripped and the completed Screen repainted.

e. The Rain Recorder requires to be levelled and made firm in the ground.

I would like to thank you, your Observers and everyone associated with the Station for the continuing co-operation with us which is very much appreciated

Yours sincerely

Phillip Doherty

Appendix B

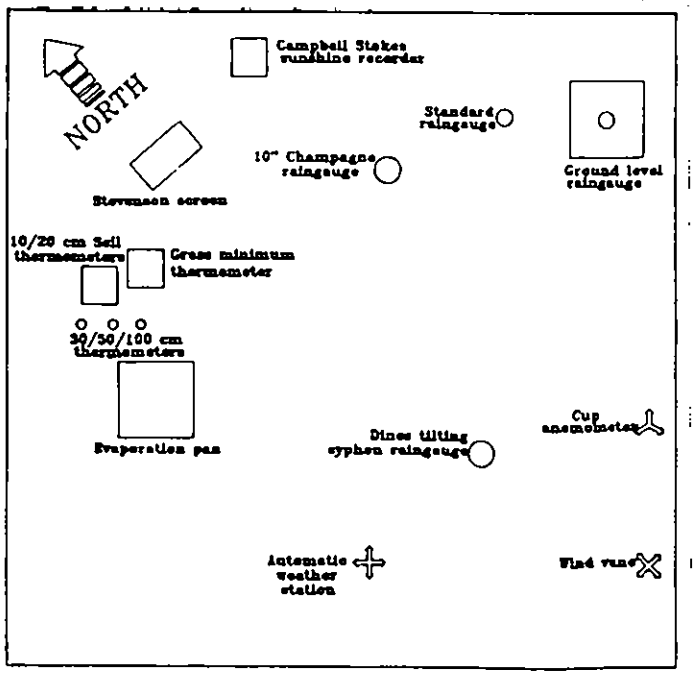
Observations made at 0900 GMT at Wallingford Meteorological Station (SU 141 618898; 51°36' latitude, 01°6' longitude;; 48 metres A.M.S.L.)

Wind speed (anometer at 2..16 m above ground)
Wind direction
Cloud cover
Present weather
Dry bulb temperature
Wet bulb temperature
Maximum temperature
Minimum temperature
Grass minimum temperature
Soil temperature at 10, 20, 30, 50, 100 cm depth
State of ground
Pan evaporation
Sunshine (Campbell Stokes recorder)
Standard rainfall
Ground level rainfall
10" 'Champagne' gauge rainfall
Snow depth and water equivalent when applicable

Other instruments:-

*Dines tilting syphon raingauge
*Solar radiation recorded by automatic weather station
*Thermograph
*Although the Dines raingauge and Thermograph are not mentioned in this report, they are used for quality control purposes and analysis after extreme events.

APPROXIMATE LOCATION OF INSTRUMENTS ON THE METEOROLOGICAL SITE (Not drawn to scale)



Appendix C

*Wallingford long term averages 1962-1989**

	MAX	MIN	MEAN	DRY	WET	10	20	30	50	100	MIN	RAIN	WIND	SUN
		(SCREEN	TEMPERATURES	'C)			(SOIL	TEMPERATURES	'C)		GRASS	mm	knts	hrs
JANUARY	6.5	0.5	3.5	3.4	2.8	4.4	4.9	4.6	6.6	6.8	-2.0	49.8	4.3	47.4
FEBRUARY	7.0	0.2	3.6	3.3	2.6	3.8	4.4	4.5	6.7	6.3	-2.3	32.1	4.3	66.5
MARCH	9.7	1.5	5.6	5.7	4.6	6.3	6.4	5.8	7.9	6.5	-1.3	45.8	4.8	105.0
APRIL	12.6	3.2	7.9	8.1	6.5	7.0	7.4	8.4	10.5	7.9	0.2	40.2	4.3	143.5
MAY	16.2	6.1	11.2	11.9	9.6	14.2	13.8	11.9	12.9	10.2	3.3	52.4	4.0	180.2
JUNE	19.5	8.9	14.2	15.0	12.5	15.8	15.4	15.2	14.5	12.6	6.3	51.9	3.5	191.2
JULY	21.6	10.9	16.3	17.3	14.5	18.4	18.5	16.9	16.5	14.5	8.2	43.3	3.3	185.0
AUGUST	21.1	10.8	16.0	16.8	14.3	17.4	17.5	16.7	16.9	15.1	7.9	56.2	3.3	173.2
SEPTEMBER	18.5	9.0	13.8	14.0	12.3	14.0	14.5	14.8	15.1	14.5	5.8	49.6	3.4	137.4
OCTOBER	14.7	6.5	10.6	10.3	9.2	10.7	11.2	12.0	12.9	13.0	3.4	51.6	3.3	98.2
NOVEMBER	10.0	2.9	6.5	6.3	5.6	6.0	6.3	8.4	9.4	10.7	0.0	53.5	3.8	62.4
DECEMBER	7.7	1.4	4.6	4.9	4.3	4.4	4.8	6.0	6.4	8.3	-1.2	57.7	4.2	37.5
AVERAGE	15.8	5.2	9.5	9.8	8.2	10.2	10.4	10.4	11.4	10.5	2.4	48.7	3.9	119.0

* DRY BULB 1972-1989
WET BULB 1972-1989
SOIL 10 1989
SOIL 20 1989
SOIL 50 1989

Wallingford Extremes 1962-90

Month	°C Max Temp	°C Min Temp	mm Max Rain	°C Max Grass	°C Min Grass	hrs Max Sun
January	13.7	-21.0	21.7	10.7	-22.2	7.6
	15/75	14/82	13/77	6/83	14/82	25/78
February	16.3	-13.2	18.6	9.6	-17.5	9.9
	23/90	13/85	1/90	20/90	13/85	12/90
March	22.2	-11.1	31.0	10.5	-15.2	11.5
	29/65	7/71	14/64	8/81	3/86	31/65
April	23.0	- 6.4	29.4	11.5	-11.5	13.6
	30/90	3/84	25/81	11/81	8/76	30/66
May	27.5	- 3.4	27.2	12.6	-10.0	14.8
	3/90	9/80	28/70	28/73	9/80	27/77
June	33.9	- 2.2	47.1	16.8	- 6.7	15.0
	27/76	1/62	10/71	29/87	1/62	30/76
July	33.3	2.0	32.3	17.8	- 5.0	15.7
	3/76	3/90	10/68	1/68	3/90	4/89
August	35.1	1.1	81.8	18.1	- 2.2	14.0
	3/90	30/64	6/62	5/75	30/64	2/81
September	29.1	- 2.8	65.3	15.5	- 7.8	11.9
	5/73	30/69	20/80	19/79	30/69	1/64
October	26.7	- 4.5	30.0	14.8	- 9.4	9.7
	1.85	30/83	9/87	1/81	24/64	17/89
November	17.8	- 8.5	36.0	12.8	-12.8	9.2
	2/69	26/89	13/74	7/72	30/69	3/88
December	15.2	-17.3	40.0	11.1	-20.6	6.2
	2/85	13/81	13/79	3/85	13/81	8/82