

METEOROLOGICAL OFFICE

London Road, Bracknell, Berkshire.

CLIMATOLOGICAL MEMORANDUM 77

**AVERAGES OF EARTH TEMPERATURE AT 30cm DEPTH
FOR THE UNITED KINGDOM 1941—70**

Climatological Services (Met.O.3)

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Introduction

This memorandum presents monthly and annual averages of daily (0900 GMT) readings of earth temperature at 30 cm depth, made during the period 1941-70. An earlier publication¹ included a detailed discussion of the factors which influence earth temperatures, so that this material is not included here. However, the practical experience of using these data over the last 10 years has indicated the importance that should be attached to site changes. This aspect has therefore been discussed further in this memorandum, and in the preparation of the tables, site changes have now been considered as breaks in the station record.

The earlier publication also included tables of earth temperatures at 122 cm depth. As a result of a World Meteorological Organization recommendation², with effect from 1 January 1971 readings at a depth of 100 cm have replaced those formerly made at 122 cm. Averages for the now obsolete depth of 122 cm have far less value than previously, because no measurements currently made can be compared with them. It was therefore decided that the considerable effort necessary to update the 122 cm averages was not justified.

Because there are relatively few stations with a full record extending over the 30 year period, construction of the anomaly maps published in the Monthly Weather Report³ is difficult. An empirical method has been developed to derive 30-year averages from 10-year averages, and details of this method are given in Appendix 1. Tables of 10-year averages for the period 1961-70, used in the empirical method, are also included in this memorandum.

Observations

All earth temperatures are measured by mercury-in-glass thermometers, each being suspended by a chain inside a vertical steel tube so that the thermometer bulb is at the correct depth. The thermometer is enclosed in a large glass tube and the bulb surrounded by a layer of wax, so that the change of temperature whilst the thermometer is being read is very small. A detailed account of the thermometer may be found in the 'Handbook of Meteorological Instruments'⁴ or the 'Observer's Handbook'⁵.

The standard exposure for earth thermometers in the United Kingdom is under an open, horizontal, short-grass covered surface. Changes in exposure, due to the ground surface being shaded from direct sunshine, or the grass being allowed to grow long, will markedly affect the readings^{1,6}.

Presentation of averages

Table 1 lists the stations for which averages have been prepared. The stations are given in alphabetical order within climatological districts, and, for each station, the administrative area name, National Grid Reference of the site and its height above mean sea level are given, together with the period of observation available and the local soil type. New administrative area names and boundaries, coming into effect in April 1974 (for England and Wales) and May 1975 (for Scotland) are used.

The averages are given in 3 tables:

- | | |
|---------|--|
| Table 2 | 1941-70 averages for 45 stations (shown in Figure 1) with homogeneous records of 20 years or more and recording 30 cm earth temperature at the end of 1970. |
| Table 3 | 1941-70 averages for 19 stations (shown in Figure 2) with homogeneous records of between 13 and 19 years, and recording 30 cm earth temperature at the end of 1970. |
| Table 4 | 1961-70 averages for 105 stations (shown in Figure 3) with a homogeneous record of 8 years or more, and recording 30 cm earth temperature at the end of 1970. This table includes values for almost all the stations listed in Tables 2 and 3. |

The record for each station has been weighted where necessary, using the method described in the next section, to produce the appropriate period average. The averages in Tables 2 to 4 are given in degrees Celsius, although many of the values, particularly for earlier years, were recorded in degrees Fahrenheit. A conversion table is given in Appendix 2.

Estimation of averages

In cases where the earth temperature readings were not available for the full period of the average, the 'difference' method has been used to obtain an estimated average. For example, if the average 30 cm earth temperature at station A, in January, was 0.1°C higher than at station B (the nearest suitable comparison station) over the common period of record, then 0.1°C was added to the values at station B for the remaining years (when records were not available at A), to give estimated values at A. The full period average was then computed using both observed and estimated values.

Changes of site

The type of soil can vary considerably, both vertically and horizontally, sometimes within the same field or garden. Different soil types have different thermal conductivities and so observations from places only a few kilometres apart may show very different earth temperatures, despite similar values of air temperature and solar radiation. The following comparison, of 30 cm earth temperature averages 1921-50 at two sites in Southport 4 km apart, illustrates this point. The soil types were reported to be "sandy soil" at Bedford Road Park (1) and "well-drained soil" at Hesketh Park (2). Both sites were 11 m above msl.

Site	J	F	M	A	M	J	J	A	S	O	N	D	Year
1	4.1	4.1	5.3	8.2	11.7	15.2	16.9	16.2	13.8	10.4	6.8	4.9	9.8 °C
2	3.1	3.3	5.0	8.8	12.9	16.8	18.4	17.6	14.6	10.3	6.1	3.9	10.1 °C

The thermal conductivity of different samples of the same soil type may be altered due to disturbance of the soil, and large temperature differences can occur over distances of a few metres where there has been differential compaction or loosening of the soil, perhaps in an attempt to improve local drainage.

The effect of a change of site on 30 cm earth temperatures is often quite marked. This is illustrated in Figure 4, which shows month by month deviations from 10-year mean differences between Woburn and Rothamsted, using a technique described by Sarson⁷. Up to about 1960, the deviations appear random, but after 1961 a regular quasi-annual cycle is evident. The station history shows that the earth thermometers at Woburn were moved on 1 January 1961. Every change of site has therefore been regarded as a break in the homogeneity of the record.

Also of interest is the effect of a change at the ground surface. At Stratford-upon-Avon it was decided that the 30 cm earth thermometer was too near the station's "bare soil" patch. Rather than move the earth thermometer, a strip of turf 15 cm wide was laid over the bare soil patch in 1966, so that the distance between the earth thermometer and the new "bare soil" patch exceeded 30 cm. The Sarson technique has been used to show, in Figure 5, the effect of this change on the month by month deviations from the mean differences between Stratford and Ross-on-Wye. Figures 4 and 5 show the need for long-term planning when the siting of an earth thermometer is being considered, so that its exposure can remain undisturbed for as many years as possible.

Comparison with previous averages

Table 5 shows the 1921-50, 1931-60 and 1941-70 averages of earth temperature at a selection of stations. The values broadly reflect similar changes in mean air temperatures, with continued cooling in the winter and warming in the autumn, notably in October.



Figure 1



Figure 2

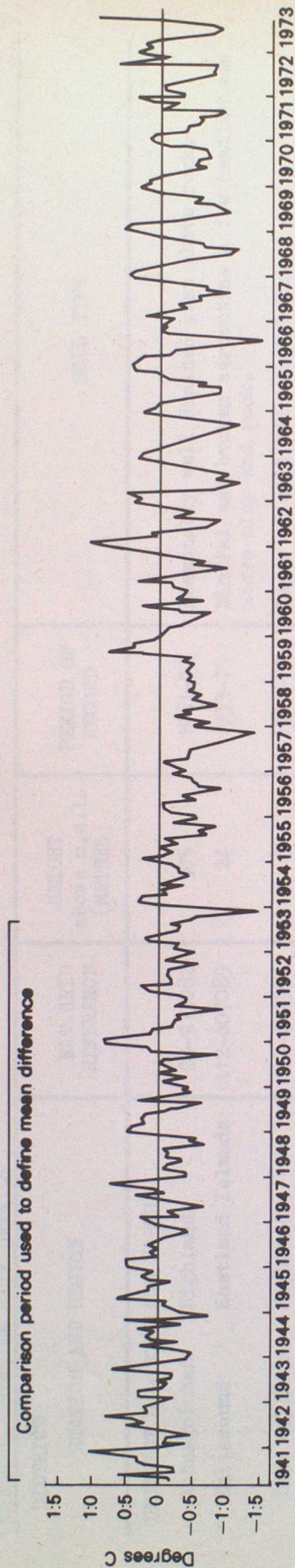


Figure 4 : Deviations from the 1941-50 mean earth temperature difference ; WOBURN minus ROTHAMPSTED

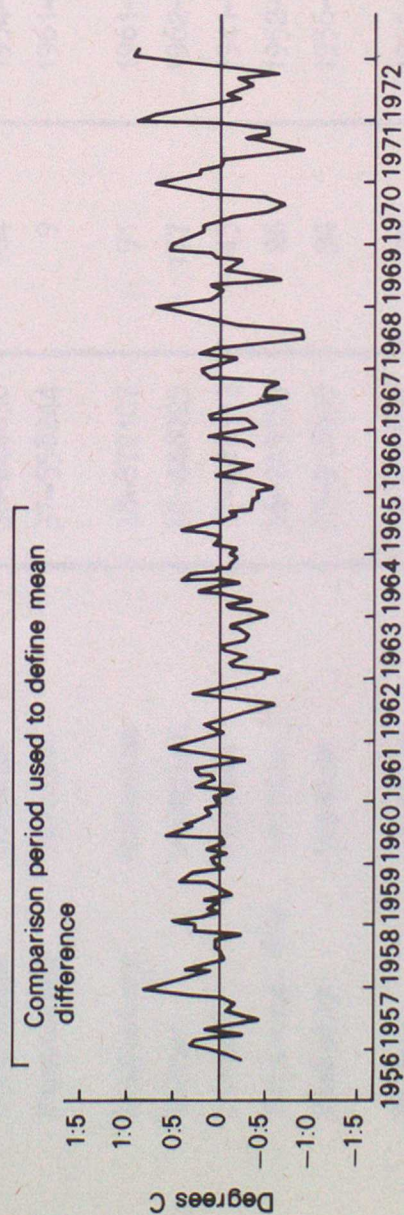


Figure 5 : Deviations from the 1956-65 mean earth temperature difference ; STRATFORD-UPON-AVON minus ROSS-ON-WYE

TABLE 1. STATION SITE DETAILS

DISTRICT	STATION AND REGION	NAT. GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 0 - SCOTLAND NORTH					
Achnagoichan	Highland	28-913082	305	1961-70	Reasonably well drained peat above rock.
Baltasound	Shetland Islands	412-607089	24	1953-70	Mineral and broken serpentine a few centimetres above clay and rock.
Isle of Rhum	Highland	17-402996	5	1961-70	Layer of soil with peat below.
Kinlochewe	Highland	28-024630	23	1961-70	Grass over well-drained peat. Surroundings boggy.
Stenness	Orkney Islands	30-298112	23	1961-70	20 cm black soil over 31 cm of clay. Occasionally waterlogged.
DISTRICT 1 - SCOTLAND EAST					
Blairgowrie	Tayside	37-175438	70	1961-70	Light black loam on top of rubble: well drained.
Bush House	Lothian	36-244636	184	1954-70	Light to medium loam.
Carnoustie	Tayside	37-558244	9	1961-70	Turf over 15 cm medium loam on top of pure sand. Well drained.
Craibstone	Grampian	38-872107	91	1961-70	Light soil with hardpan beneath.
Dinnet	Grampian	38-446025	177	1962-70	46 cm medium loam on hard red pan.
Dundee	Tayside	37-422313	45	1941-70	Loam and clay.
Edinburgh RBG	Lothian	36-245755	26	1952-70	46 cm black soil overlying sand.
Faskally	Tayside	27-918599	94	1956-70	Very light sandy soil. Probably waterlogged at 122 cm when loch level high.
Forres	Grampian	38-047587	50	1951-70	Sandy loam above sandy sub-soil.
Kinloss	Grampian	38-067627	5	1961-70	62-77 cm sandy loam on pure sand. Water table occasionally 31 cm from surface in winter.

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DISTRICT	STATION AND REGION	NAT.GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 1 - SCOTLAND EAST (cont'd)					
Mylnefield	Tayside	37-341299	30	1954-70	Sandy loam above sandy gravel.
Penicuik	Lothian	36-233599	189	1955-70	Friable loam with sandy sub-soil.
DISTRICT 6 - SCOTLAND WEST					
Auchincruive	Strathclyde	26-389236	45	1941-70	Medium loam (drift).
Dundeugh	Dumfries & Galloway	25-598879	119	1961-70	13-18 cm poor loam on boulder till. Good drainage.
Eskdalemuir	Dumfries & Galloway	36-235026	242	1941-70	60 cm peat over clay and soft rock.
Paisley	Strathclyde	26-478642	32	1941-70	Dark garden loam over boulder clay.
Rothersey	Strathclyde	26-083649	43	1961-70	9 cm brown clay. Subsoil yellow/brown clay over rock.

TABLE 1. STATION SITE DETAILS

DISTRICT	STATION AND COUNTY	NAT. GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 2 - ENGLAND EAST & NORTHEAST					
	Cockle Park Northumberland	45-200912	99	1961-70	38 cm sandy loam above millstone grit.
	Durham	45-267416	102	1948-70	Sandy loam, clay patches.
	High Mowthorpe North Yorkshire	44-888685	175	1961-70	20-25 cm top-soil over chalk.
	Hull	54-084302	2	1941-70	Loam over boulder clay.
	Kielder Castle Northumberland	35-632935	201	1952-70	Soil probably on boulder clay.
	Lincoln	43-962719	7	1946-70	Medium loam over coarse sand.
	Silpho Moor North Yorkshire	44-957946	203	1958-70	Stony, sandy loam; layer of iron Pan 0-20 cm below surface.
DISTRICT 3 - EAST ANGLIA					
	Cambridge B.G. Cambridgeshire	52-456572	12	1941-70	Sandy loam over gravel and chalk.
	Cardington Bedfordshire	52-081464	28	1961-70	Clay soil and subsoil with embedded flints.
	Clacton-on-Sea Essex	62-172143	16	1941-42; 1946-70	46 cm earth over gravel.
	Earls Colne Essex	52-858288	49	1941-70	Medium loam over gravel and flint, on top of clay
	Gorleston Norfolk	63-534037	4	1941-70	Sandy.
	Lowestoft Suffolk	62-543947	25	1941-46; 1947-70	Sandy.
	Rothamsted Hertfordshire	52-132134	128	1941-70	Clay with flints.
	St Albans Hertfordshire	52-182076	83	1941-70	Medium loam.
	Santon Downham Norfolk	52-813901	24	1958-70	Sand.

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DISTRICT	STATION AND COUNTY	NAT. GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 3 - EAST ANGLIA (Cont'd)					
	Stanstead Abbots Hertfordshire	52-389100	30	1961-70	Clay with flints and boulder clay; subsoil gravel over chalk.
	Terrington-St- Clement Norfolk	53-547187	4	1950-70	47 cm medium silt over sandy silt - well drained.
	Woburn Bedfordshire	42-964358	89	1961-70	46 cm sandy loam. Sub soil sand.
	Writtle Essex	52-677069	32	1962-70	Loam.
DISTRICT 4 - MIDLAND COUNTIES					
	Bradford West Yorkshire	44-149352	134	1941-70	Light (made up with ashes and clinkers).
	Buxton Derbyshire	43-060725	307	1941-70	8 cm loam over limestone rock.
	Edgbaston West Midlands	42-046864	163	1941-70	Earth and cinders.
	Hempsted Gloucestershire	32-811157	12	1961-70	22 cm top soil over blue clay - spoil from deep construction works.
	Huddersfield (Ravensknowle) West Yorkshire	44-163165	99	1941-70	Clay over sandy shale.
	Keele Staffordshire	33-820446	179	1951-70	Sandy clay.
	Malvern Hereford & Worcester	32-779460	62	1955-70	Red marl and gravel.
	Mansfield Nottinghamshire	43-543618	114	1961-70	Sandy overlaying limestone.
	Nottingham Nottinghamshire	43-568395	59	1941-70	Sandy soil over sandstone.
	Oxford Oxfordshire	42-509072	63	1941-70	Loam and river gravel.
	Raunds Northamptonshire	42-991721	59	1943-70	Clay and loam.

TABLE 1. STATION SITE DETAILS

DISTRICT	STATION AND COUNTY	NAT. GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 4 - MIDLAND COUNTIES (Cont'd)					
Ross-on-Wye	Hereford & Worcester	32-598237	68	1941-70	Sand over red sandstone.
Rugby	Warwickshire	42-507749	117	1947-48; 1955-70	Light loam and gravel over sand sub-soil.
Sheffield	South Yorkshire	43-339873	131	1941-70	Clay.
Shipston-on- Stour	Warwickshire	42-213407	111	1961-70	Clay.
Wallingford	Oxfordshire	41-617898	48	1961-70	Medium loam; sub soil silty over gravel.
DISTRICT 5 - ENGLAND SOUTHEAST & CENTRAL SOUTHERN					
Bexhill	East Sussex	51-737072	4	1954-70	Loam and light sand.
Bodiam	East Sussex	51-785249	22	1954-72	Loam over clay.
Dover	Kent	61-320410	6	1941; 1946-70	Loam
Eastbourne	East Sussex	50-611980	7	1946-70	Loam over chalk.
Faversham	Kent	61-007593	48	1957-72	Mixed drift.
Fernhurst	West Sussex	41-908267	57	1954-61; 1965-70	Heavy loam; subsoil stony with yellow clay - above red wealden clay.
Finchampstead	Berkshire	41-792633	65	1961-70	Sandy loam over clay.

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DISTRICT	STATION AND COUNTY	NAT. GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 5 - ENGLAND SOUTHEAST & (Cont'd) CENTRAL SOUTHERN					
Hastings	East Sussex	51-809094	45	1941-45; 1947-70	Medium-heavy loam over clay.
Hurley	Berkshire	41-823829	43	1956-70	Medium loam with flints.
Kensington Palace	Greater London	51-295801	25	1941-70	Light loam over gravel.
Leckford	Hampshire	41-393365	117	1941-70	Thin layer of loam over chalk.
Margate	Kent	61-368714	16	1943-70	Thin loam over chalk.
Porton	Wiltshire	41-210366	111	1941-70	38 cm light loam over chalk.
Southgate	Greater London	51-299952	59	1941-70	Clay.
Southsea	Hampshire	40-640990	2	1953-70	38 cm loam over gravel.
Ventnor	Isle of Wight	40-556778	135	1941-70	5 cm loam over chalk.
Worthing	West Sussex	51-153029	8	1941-70	Loam and marl with clay in places.
DISTRICT 7A - ENGLAND NORTHWEST & ISLE OF MAN					
Helmshore	Lancashire	34-774205	261	1953-70	Heavy clay loam, rock sub-soil.
Knutsford	Cheshire	33-757783	65	1961-70	Sand and clay.
Moorhouse	Cumbria	35-758328	556	1957-70	60 cm glacial clay.
Nelson	Lancashire	34-872384	165	1941-70	5 cm turf, 20 cm loam, 5 cm ash, 91 cm clay and shale, over shale and rock.

TABLE 1. STATION SITE DETAILS

DISTRICT	STATION AND COUNTY	NAT.GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 7A - ENGLAND NORTHWEST & (Cont'd) ISLE OF MAN					
Newton Rigg	Cumbria	35-493310	171	1961-70	Clay loam.
Southport	Merseyside	34-371207	5	1963-70	Sandy.
Spadeadam	Cumbria	35-599720	274	1961-70	Earth layer on peat bog.
DISTRICT 7B - WALES NORTH					
Botwnnog	Gwynedd	23-263313	34	1961-70	Medium-heavy loam over clay.
Bwlchgwyn	Clwyd	33-236520	386	1961-70	Peaty soil with underlying shale.
Lake Vyrnwy	Powys (North)	33-016192	303	1961-70	Medium-heavy loam.
Loggerheads	Clwyd	33-201622	210	1961-70	30 cm clay with shale over limestone.
DISTRICT 8A - WALES SOUTH					
Crumbland	Gwent	32-474024	245	1957-70	Sandy loam weathered from old red sandstone.
Dale Fort	Dyfed	12-823052	33	1961-70	15 cm cliff turf over red sandstone.
Llandrindod Wells	Powys (South)	32-061605	235	1961-70	30cm loam over clay.
Swansea	West Glamorgan	21-642923	8	1941-70	Sandy.
Trawscoed	Dyfed	22-674736	61	1961-70	46 cm loam over gravel.

TABLE 1. STATION SITE DETAILS

DISTRICT	STATION AND COUNTY	NAT. GRID REFERENCE	HEIGHT above m.s.l. (METRES)	PERIOD OF RECORD	SOIL TYPE
DISTRICT 8B - ENGLAND SOUTHWEST					
Bude	Cornwall	21-208063	15	1961-70	Sandy.
Cannington	Somerset	31-255399	29	1961-70	Sandy loam over partially solid sandstone.
Ilfracombe	Devon	21-520478	8	1941-70	30-46 cm light soil over shale.
Plymouth Hoe	Devon	20-478537	36	1941-70	Loam.
Starcross	Devon	20-972821	9	1961-70	Fine sandy loam.
Rosewarne	Cornwall	10-643412	76	1961-70	Medium loam.
NORTHERN IRELAND					
Armagh	Armagh	1H(23)878458	62	1941-70	Clay loam, imperfectly drained soil.
Castle Archdale Forest	Fermanagh	1H(23)189593	66	1963-70	Clay loam, freely drained soil.
Cookstown	Tyrone	1H(23)816748	77	1963-70	Loam (sand, silt and clay), freely drained soil.
Hillsborough	Down	1J(33)251577	116	1941-70	15cm sandy loam; sub soil stony over silvrian grit, imperfectly draining.
Lislap Forest	Tyrone	1H(23)485823	209	1961-70	Clay loam, imperfectly draining.
Moneydig	Londonderry	1C(24)890170	34	1948-70	Clay loam, poorly drained.
Stormont Castle Down	Down	1J(33)402749	56	1961-70	Sandy loam, freely draining soil.
CHANNEL ISLANDS					
Alderney	Alderney	555-564065	88	1961-70	20 cm medium to heavy top soil over heavy clay.
Guernsey Airport	Guernsey	554-296760	104	1949-70	Loam. Clay sub-soil.

TABLE 2 1941-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 20 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DISTRICT 1 - SCOTLAND EAST												
Dundee	1.7	2.0	4.0	7.5	11.1	14.5	16.1	15.4	13.2	9.8	5.6	3.1
Forres	2.3	2.3	3.9	7.0	10.6	13.9	15.1	14.9	12.8	9.6	5.6	3.2
DISTRICT 6 - SCOTLAND WEST												
Auchincruive	3.9	3.7	4.9	7.3	10.3	13.1	14.5	14.6	13.1	10.7	7.4	5.4
Eskdalemuir	3.4	3.3	4.2	6.6	9.5	12.4	14.0	14.2	12.9	10.4	7.1	4.8
Paisley	3.3	3.4	5.1	8.0	11.4	14.4	15.6	15.4	13.5	10.5	6.7	4.6
DISTRICT 2 - ENGLAND EAST AND NORTHEAST												
Durham	2.8	2.9	4.4	7.4	10.7	14.0	15.6	15.5	13.8	10.8	6.9	4.2
Hull	3.3	3.5	4.8	7.9	11.3	14.8	16.5	16.3	14.3	11.1	7.2	4.6
Lincoln	3.4	3.5	4.6	7.7	11.0	14.4	16.2	16.2	14.5	11.6	7.7	5.1
DISTRICT 3 - EAST ANGLIA												
Cambridge	3.6	3.8	5.5	8.9	12.5	15.9	17.5	17.2	15.3	11.9	7.7	5.0
Clacton-on-Sea	3.9	4.1	5.8	9.1	12.7	15.7	17.5	17.6	15.9	12.8	8.5	5.7
Earls Colne	3.8	3.9	5.4	8.5	12.0	15.3	17.1	16.8	14.9	11.8	7.8	5.2
Gorleston	4.4	4.3	5.6	8.8	12.2	15.3	17.0	17.1	15.5	12.5	8.5	5.9
Lowestoft	3.6	3.7	5.3	8.6	12.3	15.4	17.1	17.1	15.3	11.9	7.8	5.1
Rothamsted	3.2	3.3	4.7	7.9	11.3	14.7	16.4	16.1	14.3	11.1	7.1	4.7
St Albans	3.4	3.6	5.1	8.5	12.0	15.3	17.1	16.9	15.0	11.7	7.6	4.9
Terrington-St-Clement	3.7	3.7	5.1	8.0	11.2	14.7	16.4	16.1	14.4	11.5	7.8	5.2

TABLE 2 1941-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 20 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DISTRICT 4 - MIDLAND COUNTIES												
Bradford	2.7	2.7	3.9	6.9	10.3	13.6	15.1	15.0	13.2	10.3	6.6	4.2
Buxton	2.5	2.5	3.4	6.2	9.9	13.6	14.9	14.6	12.7	9.7	5.9	3.7
Edgbaston	4.9	4.7	5.4	7.1	9.2	11.8	13.2	13.5	12.6	10.7	7.9	6.2
Huddersfield	2.9	3.0	4.2	7.3	10.7	14.2	15.8	15.6	13.8	10.8	6.9	4.3
Keele	3.1	3.1	4.4	7.4	10.7	13.9	15.4	15.3	13.7	10.7	6.9	4.6
Nottingham	2.9	3.1	4.5	7.8	11.2	14.8	16.6	16.3	14.3	11.3	6.8	4.3
Oxford	3.4	3.6	5.4	9.0	12.7	16.2	17.8	17.5	15.4	11.8	7.4	4.9
Raunds	3.2	3.4	5.0	8.6	12.3	15.7	17.4	17.0	15.1	11.6	7.4	4.7
Ross-on-Wye	4.1	4.3	5.7	8.9	12.2	15.6	17.1	16.8	14.9	11.8	7.9	5.6
Sheffield	3.1	3.1	4.3	7.4	10.8	14.1	15.7	15.6	13.9	10.9	7.1	4.6
DISTRICT 5 - ENGLAND SOUTHEAST & CENTRAL SOUTHERN												
Dover	4.8	4.8	6.3	9.5	13.1	16.4	18.3	18.3	16.7	13.7	9.3	6.5
Eastbourne	5.1	5.1	6.4	9.5	12.9	16.2	18.0	18.0	16.4	13.5	9.5	6.8
Hastings	4.1	4.4	6.4	10.1	13.9	17.3	18.8	18.3	16.3	12.7	8.3	5.6
Kensington Palace	4.4	4.5	6.1	9.3	12.9	16.2	18.0	17.8	15.9	12.6	8.5	5.9
Leckford	4.0	4.0	5.2	8.1	11.3	14.6	16.4	16.1	14.2	11.2	7.6	5.3
Margate	4.5	4.4	5.8	9.1	12.5	16.0	17.9	17.8	15.8	12.7	8.6	6.1
Porton	3.7	3.8	5.1	8.1	11.4	14.7	16.4	16.2	14.4	11.5	7.6	5.2
Southgate	4.4	4.4	5.5	8.5	11.8	15.0	16.8	16.7	15.5	12.5	8.7	6.2
Southsea	5.0	5.1	6.7	9.9	13.5	16.9	18.5	18.3	16.5	13.5	9.5	6.8
Ventnor	5.2	5.1	6.9	10.0	13.3	16.4	18.0	17.9	16.3	13.4	9.4	6.8
Worthing	4.3	4.4	6.0	9.2	12.7	15.9	17.5	17.4	15.7	12.6	8.4	5.9

TABLE 2 1941-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 20 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DISTRICT 7A - ENGLAND NORTHWEST & ISLE OF MAN												
Nelson	2.7	2.7	4.0	6.9	10.6	14.1	15.7	15.4	13.3	10.1	6.4	4.0
DISTRICT 8A - WALES SOUTH												
Swansea	4.6	4.8	6.7	10.3	14.0	17.5	18.8	18.5	16.3	12.9	8.6	6.2
DISTRICT 8B - ENGLAND SOUTHWEST												
Ilfracombe	5.8	5.8	7.3	10.3	13.6	16.6	18.0	17.8	16.0	13.2	9.5	7.2
Plymouth Hoe	5.9	5.8	7.1	9.9	12.8	15.7	17.3	17.2	15.7	13.0	9.6	7.4
NORTHERN IRELAND												
Armagh	3.8	4.0	6.0	8.9	12.5	15.6	16.8	16.5	14.4	11.3	7.3	5.2
Hillsborough	4.5	4.3	5.4	7.7	10.5	13.5	14.9	14.9	13.4	11.0	7.8	5.9
Moneydig	4.4	4.2	5.4	7.9	11.1	14.3	15.8	15.9	14.3	11.5	8.1	5.9
CHANNEL ISLANDS												
Guernsey Airport	6.1	5.9	7.0	9.7	12.6	15.7	17.4	17.5	16.0	13.4	9.8	7.7

TABLE 3 1941-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF BETWEEN 13 AND 19 YEARS

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DISTRICT 0 - SCOTLAND NORTH												
Baltasound	4.0	3.6	3.9	5.2	7.2	9.7	11.3	11.5	10.7	8.9	6.8	5.2
DISTRICT 1 - SCOTLAND EAST												
Bush House	1.9	1.9	3.4	6.3	9.7	13.1	14.5	14.4	12.5	9.3	5.6	3.1
Edinburgh RBG	2.3	2.5	4.3	7.4	10.8	13.9	15.4	15.0	13.0	9.9	6.0	3.7
Faskally	1.6	1.7	3.4	6.8	10.3	13.9	15.3	15.0	13.0	9.6	5.5	3.0
Mylnefield	2.0	2.2	3.9	6.7	10.0	13.3	14.8	14.5	12.6	9.5	5.6	3.3
Penicuik	2.0	2.2	3.7	6.7	10.1	13.5	14.7	14.5	12.5	9.4	5.7	3.3
DISTRICT 2 - ENGLAND EAST & NORTHEAST												
Kielder Castle	2.4	2.4	3.6	6.5	10.0	13.2	14.9	14.8	13.0	10.1	6.3	3.9
Silpho Moor	2.6	2.5	3.3	6.0	9.1	12.4	14.2	14.0	12.1	9.5	6.1	3.8
DISTRICT 3 - EAST ANGLIA												
Santon Downham	3.6	3.6	4.7	7.7	10.9	13.9	15.8	15.9	14.3	11.3	7.8	5.1
DISTRICT 4 - MIDLAND COUNTIES												
Malvern	4.0	4.1	5.5	8.8	12.3	16.0	17.6	17.3	15.3	12.0	8.0	5.5
Rugby	2.9	3.2	4.8	8.4	12.1	15.6	17.1	16.6	14.5	11.0	6.8	4.4

TABLE 3 1941-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF BETWEEN 13 AND 19 YEARS

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DISTRICT 5 - ENGLAND SOUTHEAST & CENTRAL SOUTHERN												
Bexhill	5.1	5.3	6.8	10.0	13.5	16.7	18.1	18.1	16.2	13.1	9.2	6.6
Bodiam	4.3	4.5	5.9	9.1	12.9	16.2	17.9	17.8	15.8	12.6	8.6	5.9
Faversham	3.9	4.0	5.3	8.4	11.9	15.5	17.4	17.3	15.3	11.9	7.7	5.3
Fernhurst	4.1	4.3	5.8	8.9	12.5	16.0	17.7	17.4	15.4	12.0	7.9	5.5
Hurley	3.6	3.7	5.3	8.7	12.3	16.0	17.7	17.1	15.1	11.5	7.4	5.0
DISTRICT 7A - ENGLAND NORTHWEST & ISLE OF MAN												
Helmshore	3.1	3.1	4.1	6.7	9.8	13.3	14.5	14.2	12.4	9.7	6.3	4.2
Moorhouse	1.3	1.3	1.9	3.9	7.2	10.1	11.8	11.8	10.1	7.6	4.3	2.4
DISTRICT 8A - WALES SOUTH												
Crumblant	3.5	3.5	4.8	7.8	11.1	14.5	15.8	15.6	13.9	11.0	7.2	4.9
												9.5

TABLE 4

1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
DISTRICT 0 - SCOTLAND NORTH												
Achnagoichan	2.2	2.0	2.9	4.6	7.8	10.5	11.5	11.9	10.7	8.6	5.1	3.1
Baltasound	4.1	3.8	4.0	4.9	7.2	9.7	10.9	11.4	10.6	9.1	6.5	5.0
Isle of Rhum	3.8	3.7	5.3	7.9	11.6	14.9	15.7	15.5	13.6	11.0	7.1	5.1
Kinlochewe	3.4	3.4	4.3	6.4	9.4	12.7	13.4	13.9	12.6	10.2	6.6	4.5
Stenness	3.7	3.4	4.2	5.7	8.5	11.2	12.0	12.4	11.4	9.6	6.4	4.4
DISTRICT 1 - SCOTLAND EAST												
Blairgowrie	1.2	1.5	3.1	6.3	10.4	14.3	15.2	15.1	13.2	9.9	5.2	2.2
Bush House	1.8	2.0	3.4	6.0	9.8	13.5	14.3	14.5	12.8	9.8	5.5	2.8
Carnoustie	2.5	3.0	4.7	1.7	11.5	15.3	16.3	16.1	14.1	10.9	6.1	3.4
Craibstone	2.5	2.5	3.6	5.7	9.0	12.6	13.6	13.7	12.4	9.8	5.9	3.5
Dinnet	2.0	2.2	3.3	5.7	9.0	12.7	13.6	13.4	12.0	9.3	5.2	2.9
Dundee	1.7	2.2	3.9	7.2	11.3	14.8	15.9	15.4	13.5	10.4	5.6	2.7
Edinburgh RBG	2.4	2.8	4.3	7.1	10.9	14.1	15.1	15.1	13.3	10.3	6.2	3.4
Faskally	1.7	1.9	3.5	6.6	10.4	14.1	15.1	15.0	13.2	10.1	5.5	2.7
Forres	2.3	2.3	3.9	7.0	10.6	13.9	15.1	14.9	12.8	9.6	5.6	3.2
Kinloss	2.8	2.9	4.3	6.4	9.4	12.4	13.3	13.6	12.4	9.9	6.1	4.0
Mylnefield	1.9	2.3	3.8	6.5	10.1	13.6	14.5	14.4	12.7	9.8	5.3	2.7
Penicuik	1.9	2.3	3.6	6.5	10.3	13.8	14.5	14.6	12.9	9.8	5.6	2.9

TABLE 4 1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30 CM EARTH TEMPERATURE IN DEGREES CELSIUS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
DISTRICT 6 - SCOTLAND WEST													
Auchincruive	3.8	3.6	4.6	6.8	10.1	13.1	13.9	14.1	12.9	10.7	7.2	5.1	8.8
Dundeugh	3.4	3.5	4.1	5.9	8.8	11.6	12.8	13.1	12.1	10.3	7.1	4.9	8.1
Eskdalemuir	3.3	3.4	4.0	6.1	9.2	12.4	13.5	14.0	13.0	10.8	7.3	4.7	8.5
Paisley	3.1	3.4	5.0	7.7	11.2	14.4	14.9	14.9	13.5	10.7	6.5	4.1	9.1
Rotheray	3.3	3.3	4.4	6.7	10.1	13.4	14.0	14.1	12.8	10.3	6.6	4.4	8.6
DISTRICT 2 - ENGLAND EAST & NORTHEAST													
Gockle Park	2.5	2.5	3.5	6.2	9.8	13.4	14.3	14.2	12.6	10.0	6.0	3.2	8.2
Durham	2.7	2.9	4.2	7.0	10.6	14.1	15.0	15.3	13.9	11.1	6.9	3.9	9.0
High Mowthorpe	2.1	2.5	3.3	5.9	9.8	13.9	14.9	14.8	13.1	10.5	6.4	3.3	8.4
Hull	3.0	3.5	4.7	7.7	11.3	14.8	15.9	15.9	14.3	11.5	7.3	4.2	9.5
Kielder Castle	2.2	2.7	3.4	6.1	9.9	13.4	14.6	14.8	13.2	10.5	6.5	3.7	8.4
Lincoln	3.0	3.3	4.3	7.2	11.1	14.8	16.0	16.1	14.5	11.9	7.7	4.5	9.5
Silpho Moor	2.4	2.5	3.3	5.7	9.1	12.4	13.5	13.6	12.3	9.9	6.1	3.5	7.9
DISTRICT 3 - EAST ANGLIA													
Cambridge BG	3.2	3.8	5.1	8.6	12.6	16.1	17.3	16.9	15.2	12.1	7.7	4.3	10.2
Cardington	3.6	3.9	4.8	7.8	11.5	14.9	16.4	16.1	14.7	12.0	8.0	4.9	9.9
Clacton-on-Sea	3.8	4.3	5.7	8.9	12.9	15.9	17.3	17.3	15.8	13.2	8.8	5.4	10.8

Sandy loam
clay

TABLE 4

1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
DISTRICT 3 (continued)													
Earls Colne	3.7	3.9	5.1	8.3	12.0	15.5	16.7	16.5	14.7	11.9	7.8	4.7	10.1
Gorleston	4.1	4.3	5.4	8.5	12.4	15.8	16.9	16.9	15.4	12.5	8.3	5.3	10.5
Lowestoft	3.5	3.7	5.0	8.3	12.2	15.5	16.7	16.6	15.1	12.2	7.9	4.7	10.1
Rothamsted	3.3	3.7	4.7	7.6	11.3	14.5	15.9	15.7	14.3	11.7	7.6	4.6	9.6
St Albans	3.4	3.8	5.0	8.1	12.1	15.3	16.6	16.6	14.9	12.0	7.9	4.7	10.0
Santon Downham	3.3	3.6	4.4	7.4	11.0	14.1	15.6	15.7	14.2	11.6	7.7	4.5	9.4
Stanstead Abbotts	4.5	4.6	5.7	8.5	12.4	15.8	17.6	17.4	15.8	13.2	9.0	5.4	10.8
Terrington St Clement	3.2	3.5	4.7	7.7	11.3	15.0	16.4	15.9	14.3	11.5	7.5	4.4	9.6
Woburn	3.3	3.6	4.7	7.8	11.7	15.3	16.7	16.3	14.6	11.9	7.8	4.6	9.9
Writtle	3.8	4.1	5.1	8.1	11.8	15.1	16.6	16.3	14.8	12.0	7.9	4.9	10.0
DISTRICT 4 - MIDLAND COUNTIES													
Bradford	2.6	2.9	3.8	6.7	10.4	13.9	14.9	15.0	13.5	10.9	7.0	4.0	8.8
Buxton	2.2	2.4	3.0	5.9	10.1	14.1	14.7	14.4	12.6	9.9	5.6	3.2	8.2
Edgbaston	4.9	4.7	5.2	6.8	9.2	11.9	12.9	13.2	12.6	11.0	7.9	5.9	8.9
Hempsted	4.6	4.9	5.9	8.8	12.4	16.0	17.1	16.9	15.4	12.7	8.8	6.0	10.8
Huddersfield (Ravensknowle)	2.6	3.0	4.0	7.0	10.9	14.5	15.4	15.3	13.8	11.1	6.9	3.9	9.0
Keele	2.7	2.9	3.9	6.9	10.6	14.0	14.9	14.9	13.4	10.8	6.7	4.1	8.8
Malvern	3.8	4.1	5.2	8.3	12.3	16.0	17.3	17.0	15.1	12.1	7.9	5.0	10.3
Mansfield	2.8	3.1	4.4	7.5	11.4	15.4	16.3	15.9	13.9	10.9	6.5	3.9	9.3

TABLE 4 1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
DISTRICT 4 (continued)													
Nottingham	2.5	3.1	4.1	7.5	11.3	15.1	16.4	16.1	14.3	11.3	6.7	3.7	9.3
Oxford	3.1	3.7	5.1	8.7	12.9	16.6	17.7	17.3	15.4	12.1	7.5	4.3	10.4
Raunds	2.8	3.3	4.8	8.3	12.5	16.1	17.2	16.8	15.0	11.8	7.4	4.2	10.0
Ross-on-Wye	3.9	4.3	5.4	8.5	12.3	15.8	17.0	16.6	14.8	12.0	7.8	5.1	10.3
Rugby	2.5	3.0	4.4	7.8	12.1	15.9	17.0	16.3	14.3	11.0	6.5	3.6	9.5
Sheffield	2.9	3.2	4.3	7.2	11.1	14.6	15.7	15.7	14.1	11.5	7.1	4.4	9.3
Shipston-on-Stour	3.8	4.0	4.6	7.2	10.9	14.5	15.9	15.5	14.1	11.6	8.0	5.2	9.6
Wallingford	3.8	4.2	5.3	8.2	12.0	15.4	16.7	16.4	14.8	12.2	8.2	5.2	10.2
DISTRICT 5 - ENGLAND SOUTHEAST & CENTRAL SOUTHERN													
Bexhill	4.9	5.1	6.5	9.5	13.3	16.6	17.9	17.7	16.1	13.2	9.1	6.0	11.3
Bodiam	4.1	4.5	5.6	8.7	12.7	16.1	17.7	17.5	15.7	12.8	8.6	5.4	10.8
Dover	4.8	5.0	6.3	9.2	13.1	16.3	17.9	18.0	16.8	14.1	9.5	6.1	11.4
Eastbourne	5.0	5.3	6.5	9.4	13.0	16.3	17.8	17.8	16.4	13.7	9.6	6.4	11.4
Faversham	4.1	4.3	5.4	8.2	12.1	15.5	17.2	17.1	15.4	12.7	8.5	5.1	10.5
Finchampstead	4.4	4.6	5.3	7.7	10.8	13.8	15.5	15.6	14.3	12.0	8.5	5.8	9.9
Hastings	3.9	4.3	6.1	9.6	13.8	17.2	18.5	17.9	16.0	12.8	8.2	4.8	11.1
Hurley	3.4	3.9	5.1	8.3	12.2	16.1	17.5	16.8	14.9	11.9	7.5	4.5	10.2

TABLE 4 1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
DISTRICT 5 (continued)													
Kensington Palace	4.2	4.7	6.0	9.1	13.0	16.4	18.0	17.6	15.9	12.9	8.2	5.3	10.9
Leckford	4.1	4.3	5.2	7.8	11.1	14.5	15.8	15.5	14.1	11.6	7.8	5.2	9.7
Margate	4.3	4.5	5.6	8.8	12.5	15.8	17.5	17.3	15.6	12.8	8.5	5.5	10.7
Porton	3.3	3.6	4.7	7.5	11.1	14.5	15.8	15.4	13.9	11.3	7.3	4.5	9.4
Southgate	4.0	4.6	5.4	8.1	11.7	15.0	16.5	16.5	15.7	12.8	8.8	5.8	10.4
Southsea	4.8	5.1	6.5	9.6	13.4	16.8	18.3	18.0	16.5	13.7	9.6	6.3	11.5
Ventnor	4.8	4.9	6.5	9.5	13.0	16.2	17.7	17.4	16.0	13.5	9.3	6.2	11.3
Worthing	4.3	4.5	6.0	9.0	12.8	16.0	17.3	17.1	15.7	12.9	8.7	5.6	10.8
DISTRICT 7A - ENGLAND NORTH- WEST & ISLE OF MAN													
Helmshore	2.9	3.1	3.9	6.4	9.7	13.2	13.8	13.8	12.6	10.1	6.3	3.9	8.3
Knutsford	2.7	2.9	4.3	7.6	11.9	15.7	16.7	17.0	14.8	11.6	6.8	4.0	9.7
Moorhouse	1.2	1.3	1.6	3.4	7.1	10.2	11.2	11.5	10.3	8.0	4.5	2.4	6.1
Nelson	2.5	2.7	3.8	6.6	10.4	14.0	15.0	15.1	13.5	10.6	6.4	3.7	8.7
Newton Rigg	2.0	2.4	3.5	6.6	10.3	14.1	14.9	14.8	13.2	10.2	6.0	3.1	8.4
Southport	3.2	3.2	5.0	8.1	11.8	15.4	16.0	15.7	13.9	11.0	6.6	4.1	9.5
Spadeadam	1.6	1.9	2.7	5.1	8.6	12.3	13.1	13.3	11.7	9.1	5.0	2.5	7.2

TABLE 4 1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
DISTRICT 7B - WALES NORTH													
Botwnnog	4.7	4.8	6.2	9.1	12.6	16.1	17.1	16.9	15.1	12.4	8.4	6.0	10.8
Bwlchgwyn	3.0	3.1	3.5	5.5	8.4	11.5	12.6	12.8	11.5	9.6	6.2	4.2	7.7
Lake Vyrnwy	2.9	3.1	3.6	6.1	9.6	12.9	14.0	14.1	12.7	10.5	6.7	4.3	8.4
Loggerheads	3.1	3.2	3.9	6.5	10.1	13.5	14.4	14.4	12.9	10.5	6.5	4.2	8.6
DISTRICT 8A -WALES SOUTH													
Crumblant	3.3	3.5	4.5	7.4	11.1	14.6	15.5	15.3	13.8	11.2	7.2	4.5	9.3
Dale Fort	5.5	5.4	6.5	9.3	12.5	15.9	17.0	16.6	14.8	12.3	8.7	6.7	10.9
Llandrindod Wells	3.7	3.9	4.6	7.2	10.4	13.5	14.7	14.9	13.7	11.4	7.7	5.1	9.2
Swansea	4.1	4.6	6.3	9.9	13.8	17.6	18.5	18.1	16.0	13.0	8.2	5.5	11.3
Trawscoed	4.4	4.4	5.1	7.4	10.5	13.4	14.8	14.9	14.0	11.9	8.5	6.0	9.6
DISTRICT 8B - ENGLAND SOUTHWEST													
Bude	4.2	4.4	5.6	8.5	11.9	15.0	16.2	16.0	14.5	11.8	8.0	5.7	10.1
Cannington	5.2	5.4	6.4	8.9	12.2	15.6	16.7	16.7	15.2	12.9	9.3	6.7	10.9
Ilfracombe	5.5	5.7	7.1	10.1	13.7	16.9	18.0	17.6	16.0	13.4	9.4	6.9	11.7
Plymouth Hoe	5.9	6.0	7.0	9.6	12.6	15.5	16.8	16.9	15.9	13.3	9.8	7.4	11.4
Starcross	4.9	5.3	6.5	9.2	12.7	16.0	17.2	16.9	15.3	12.6	8.6	6.1	10.9
Rosewarne	5.8	5.8	6.7	9.3	12.1	15.4	16.7	16.5	15.1	12.6	9.0	7.0	11.0

TABLE 4 1961-70 AVERAGES FOR STATIONS WITH A HOMOGENEOUS RECORD OF 8 YEARS OR MORE

DISTRICT AND STATION	AVERAGE 30CM EARTH TEMPERATURE IN DEGREES CELSIUS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORTHERN IRELAND													
Armagh	3.7	3.9	5.8	8.8	12.6	16.0	16.9	16.7	14.7	11.7	7.3	5.0	10.3
Castle Archdale Forest	4.1	4.2	5.6	7.9	11.1	14.3	14.8	14.9	13.4	11.1	7.3	5.2	9.5
Cookstown	3.7	3.8	5.2	7.6	11.0	14.3	14.9	14.9	13.2	10.9	7.1	5.0	9.3
Hillsborough	4.3	4.1	5.1	7.1	10.3	13.5	14.5	14.5	13.2	11.0	7.6	5.5	9.2
Lislap Forest	3.5	3.6	4.9	7.3	10.8	14.1	14.7	14.9	13.4	10.9	7.2	5.0	9.2
Moneydig	3.9	4.0	5.1	7.7	11.5	14.8	15.9	16.0	14.4	11.7	7.8	5.5	9.9
Stormont Castle	3.5	3.8	5.4	8.1	11.6	15.0	15.7	15.7	14.1	11.2	6.9	4.6	9.6
CHANNEL ISLANDS													
Alderney	6.2	6.0	6.8	9.1	12.1	15.1	16.6	16.5	15.4	13.3	9.7	7.5	11.2
Guernsey Airport	6.1	6.0	6.9	9.4	12.5	15.4	16.9	17.0	15.8	13.5	9.9	7.5	11.4

Table 5 EARTH TEMPERATURE NORMALS FOR 30 YEAR PERIODS AT 30CM DEPTH

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Dundee													
1921-50	2.3	2.5	4.2	7.1	10.4	13.9	15.8	15.4	13.1	9.4	5.3	3.3	8.6
1931-60	2.0	2.2	4.2	7.4	11.0	14.4	16.2	15.7	13.2	9.5	5.6	3.3	8.7
1941-70	1.7	2.0	4.0	7.5	11.1	14.5	16.1	15.4	13.2	9.8	5.6	3.1	8.7
Eskdalemuir													
1921-50	3.7	3.4	4.2	6.4	9.4	12.4	14.2	14.2	12.6	9.8	6.4	4.6	8.4
1931-60	3.6	3.2	4.3	6.7	9.7	12.5	14.2	14.4	12.8	10.1	7.0	4.9	8.6
1941-70	3.4	3.3	4.2	6.6	9.5	12.4	14.0	14.2	12.9	10.4	7.1	4.8	8.6
Armagh													
1921-50	4.5	4.7	5.9	8.5	11.8	14.9	16.3	16.1	14.0	10.8	7.2	5.3	10.0
1931-60	4.1	4.3	5.9	8.9	12.3	15.4	16.7	16.4	14.2	10.8	7.3	5.3	10.2
1941-70	3.8	4.0	6.0	8.9	12.5	15.6	16.8	16.5	14.4	11.3	7.3	5.2	10.2
Buxton													
1921-50	2.9	2.7	3.6	6.1	9.6	13.3	15.0	14.7	12.6	9.2	5.7	3.7	8.3
1931-60	2.8	2.4	3.5	6.2	9.7	13.4	14.9	14.8	12.7	9.4	6.0	3.9	8.3
1941-70	2.5	2.5	3.4	6.2	9.9	13.6	14.9	14.6	12.7	9.7	5.9	3.7	8.3
Gorleston													
1921-50	4.6	4.5	5.8	8.8	12.2	15.4	17.4	17.3	15.6	11.9	8.1	5.6	10.6
1931-60	4.6	4.3	5.8	8.8	12.2	15.3	17.2	17.3	15.6	12.2	8.6	6.0	10.7
1941-70	4.4	4.3	5.6	8.8	12.2	15.3	17.0	17.1	15.5	12.5	8.5	5.9	10.6
Cambridge													
1921-50	3.9	4.1	5.6	8.8	12.2	15.6	17.5	17.3	15.3	11.4	7.4	4.9	10.3
1931-60	3.8	3.8	5.7	8.9	12.4	15.8	17.6	17.5	15.3	11.5	7.7	5.1	10.4
1941-70	3.6	3.8	5.5	8.9	12.5	15.9	17.5	17.2	15.3	11.9	7.7	5.0	10.4
Ross-on-Wye													
1921-50	4.4	4.4	5.7	8.7	12.2	15.6	17.3	16.9	14.9	11.2	7.4	5.2	10.3
1931-60	4.3	4.2	5.8	8.9	12.2	15.6	17.2	17.1	14.9	11.4	8.0	5.6	10.4
1941-70	4.1	4.3	5.7	8.9	12.2	15.6	17.1	16.8	14.9	11.8	7.9	5.6	10.4
Oxford													
1921-50	4.1	4.2	5.7	9.0	12.7	16.2	17.9	17.7	15.6	11.4	7.2	4.8	10.5
1931-60	3.8	3.7	5.6	9.1	12.7	16.2	17.9	17.8	15.6	11.4	7.5	5.0	10.5
1941-70	3.4	3.6	5.4	9.0	12.7	16.2	17.8	17.5	15.4	11.8	7.4	4.9	10.4
Kensington													
1921-50	4.7	4.6	5.9	8.9	12.5	15.9	17.8	17.7	15.7	11.8	8.1	5.6	10.8
1931-60	4.7	4.6	6.1	9.2	12.7	16.2	17.9	17.9	15.9	12.2	8.5	6.0	11.0
1941-70	4.4	4.5	6.1	9.3	12.9	16.2	18.0	17.8	15.9	12.6	8.5	5.9	11.0

Table 5 Contd

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Plymouth Hoe													
1921-50	6.1	5.9	7.1	9.9	13.1	16.2	17.8	17.5	15.6	12.3	8.9	6.8	11.4
1931-60	6.0	5.7	7.1	10.0	13.0	16.1	17.7	17.6	15.7	12.5	9.3	7.1	11.5
1941-70	5.9	5.8	7.1	9.9	12.8	15.7	17.3	17.2	15.7	13.0	9.6	7.4	11.5
Ventor													
1921-50	5.5	5.6	7.1	10.1	13.6	16.6	18.2	18.2	16.5	13.0	9.2	6.5	11.7
1931-60	5.4	5.3	7.1	10.2	13.6	16.7	18.2	18.3	16.4	13.2	9.4	6.8	11.7
1041-70	5.2	5.1	6.9	10.0	13.3	16.4	18.0	17.9	16.3	13.4	9.4	6.8	11.6

APPENDIX 1. Estimation of 30-year averages from 10-year averages

Many factors affect earth temperatures at depths of less than 1 metre. Given a fixed amount of incident radiation, different kinds of soil will produce different values of earth temperature, and large changes in the thermal conductivity can be brought about by very small changes in water content. These and other factors have been discussed by Geiger⁸, Jen Hu Chang⁹, Sutton¹⁰ and Blanc¹¹. However, it has been shown by Geiger and others that the daily variation in earth temperature at 30 cm or less corresponds well with daily changes in air temperature, particularly on clear days, and further investigation has shown that variations in monthly mean earth temperatures at 30 cm depth follow closely variations in monthly mean daily maximum air temperatures.

Some statistics derived for the two periods 1941-70 and 1961-70 for three UK stations are presented in Table A1. The d values characterise the differences between the response of 30 cm earth temperatures to air temperatures in the two periods, and so would be expected to display good coherence in space each month and reasonable continuity from one month to the next. As can be seen, d is small in comparison with the standard deviations of differences between monthly mean earth and mean daily maximum air temperatures.

Monthly maps of d were prepared and analysed and, because of the space and time continuity mentioned above, it proved possible to extend the analysis with reasonable confidence over areas where few plotted d values were available (i.e. those areas without E_{30} values). d values were then interpolated at those stations with E_{10} , T_{10} and T_{30} values and thus estimates of E_{30} were derived.

These additional stations' estimated E_{30} values have been used from January 1974 onwards to assist the preparation of the map of departures from average of 30 cm earth temperature. In the analysis of this map, naturally more weight is given to those stations with conventionally-derived 30-year averages, but the additional stations enable the analysis to be extended over those regions of the UK which were previously impossible to analyse.

APPENDIX 1 (Cont'd)

TABLE A1

Station		Rothamsted		Buxton		Lincoln	
Altitude (metres)		128		307		7	
1941-70		Jan	Jul	Jan	Jul	Jan	Jul
No of pairs of values		30	30	29	30	23	24
T_{30}	Mean maximum air temp (°C)	5.3	20.7	4.0	17.5	5.7	20.7
E_{30}	Mean 30 cm earth temp (°C)	3.2	16.4	2.4	15.0	3.5	16.2
$D_{30} = T_{30} - E_{30}$		2.1	4.3	1.6	2.5	2.2	4.5
S.D. of differences between monthly mean daily max. air temp. and monthly mean 30 cm earth temp.		1.0	0.7	0.9	1.1	1.0	1.1
1961-70							
No of pairs of values		10	10	10	10	9	10
T_{10}	Mean maximum air temp (°C)	5.3	20.0	3.9	16.6	5.5	19.9
E_{10}	Mean 30 cm earth temp (°C)	3.3	15.9	2.2	14.7	2.9	16.0
$D_{10} = T_{10} - E_{10}$		2.0	4.1	1.7	1.9	2.6	3.9
S.D. of differences		1.3	0.8	0.8	0.7	1.0	1.1
$d = D_{30} - D_{10}$		0.1	0.2	-0.1	0.6	-0.4	0.6

APPENDIX 2. CONVERSION TABLE FROM DEGREES CELSIUS TO DEGREES FAHRENHEIT

	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
CELSIUS	FAHRENHEIT									
25	77.0	77.2	77.4	77.5	77.7	77.9	78.1	78.3	78.4	78.6
24	75.2	75.4	75.6	75.7	75.9	76.1	76.3	76.5	76.6	76.8
23	73.4	73.6	73.8	74.0	74.1	74.3	74.5	74.7	74.8	75.0
22	71.6	71.8	72.0	72.1	72.3	72.5	72.7	72.9	73.0	73.2
21	69.8	70.0	70.2	70.3	70.5	70.7	70.9	71.1	71.2	71.4
20	68.0	68.2	68.4	68.5	68.7	68.9	69.1	69.3	69.4	69.6
19	66.2	66.4	66.6	66.7	66.9	67.1	67.3	67.5	67.6	67.8
18	64.4	64.6	64.8	64.9	65.1	65.3	65.5	65.7	65.8	66.0
17	62.6	62.8	63.0	63.1	63.3	63.5	63.7	63.9	64.0	64.2
16	60.8	61.0	61.2	61.3	61.5	61.7	61.9	62.1	62.2	62.4
15	59.0	59.2	59.4	59.5	59.7	59.9	60.1	60.3	60.4	60.6
14	57.2	57.4	57.6	57.7	57.9	58.1	58.3	58.5	58.6	58.8
13	55.4	55.6	55.8	55.9	56.1	56.3	56.5	56.7	56.8	57.0
12	53.6	53.8	54.0	54.1	54.3	54.5	54.7	54.9	55.0	55.2
11	51.8	52.0	52.2	52.3	52.5	52.7	52.9	53.1	53.2	53.4
10	50.0	50.2	50.4	50.5	50.7	50.9	51.1	51.3	51.4	51.6
9	48.2	48.4	48.6	48.7	48.9	49.1	49.3	49.5	49.6	49.8
8	46.4	46.6	46.8	46.9	47.1	47.3	47.5	47.7	47.8	48.0
7	44.6	44.8	45.0	45.1	45.3	45.5	45.7	45.9	46.0	46.2
6	42.8	43.0	43.2	43.3	43.5	43.7	43.9	44.1	44.2	44.4
5	41.0	41.2	41.4	41.5	41.7	41.9	42.1	42.3	42.4	42.6
4	39.2	39.4	39.6	39.7	39.9	40.1	40.3	40.5	40.6	40.8
3	37.4	37.6	37.8	37.9	38.1	38.3	38.5	38.7	38.8	39.0
2	35.6	35.8	36.0	36.1	36.3	36.5	36.7	36.9	37.0	37.2
1	33.8	34.0	34.2	34.3	34.5	34.7	34.9	35.1	35.2	35.4
0	32.0	32.2	32.4	32.5	32.7	32.9	33.1	33.3	33.4	33.6
-0	32.0	31.8	31.6	31.5	31.3	31.1	30.9	30.7	30.6	30.4
-1	30.2	30.0	29.8	29.7	29.5	29.3	29.1	28.9	28.8	28.6
-2	28.4	28.2	28.0	27.9	27.7	27.5	27.3	27.1	27.0	26.8
-3	26.6	26.4	26.2	26.1	25.9	25.7	25.5	25.3	25.2	25.0
-4	24.8	24.6	24.4	24.3	24.1	23.9	23.7	23.5	23.4	23.2
-5	23.0	22.8	22.6	22.5	22.3	22.1	21.9	21.7	21.6	21.4

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