THE CLIMATE OF GREAT BRITAIN

THE MIDLANDS

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The front cover shows a view of England and Wales from the Satellite Tiros-N taken at 1518 GMT on Wednesday, 2 April 1980 — photograph by courtesy of the Department of Electrical Engineering and Electronics, University of Dundee.

An anticyclone was situated to the south-west of the British Isles and a showery north-westerly airstream covered Britain. The alignment of the clouds with the surface wind is clearly seen. The Midlands had about 8 hours of sunshine with a few rain showers mainly in the afternoon and maximum temperatures about 12°C.

THE CLIMATE OF GREAT BRITAIN

Climatological Memorandum 132

The Midlands

INTRODUCTION

This memorandum is one of a series which will cover the whole of Great Britain and seeks to present the main features of the climate of the area in a form suitable for use in schools and by members of the general public.

There is an Introduction to the series (Climatological Memorandum 113) which explains how the various weather elements are measured and defines some of the more common terms.

Industrial and commercial interests who are concerned with meteorological information for planning and design will probably require more complex analyses of the available data, and details of the services offered by the Meteorological Office to meet those needs are given on page 16.

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Met O 3 (Advisory Services)

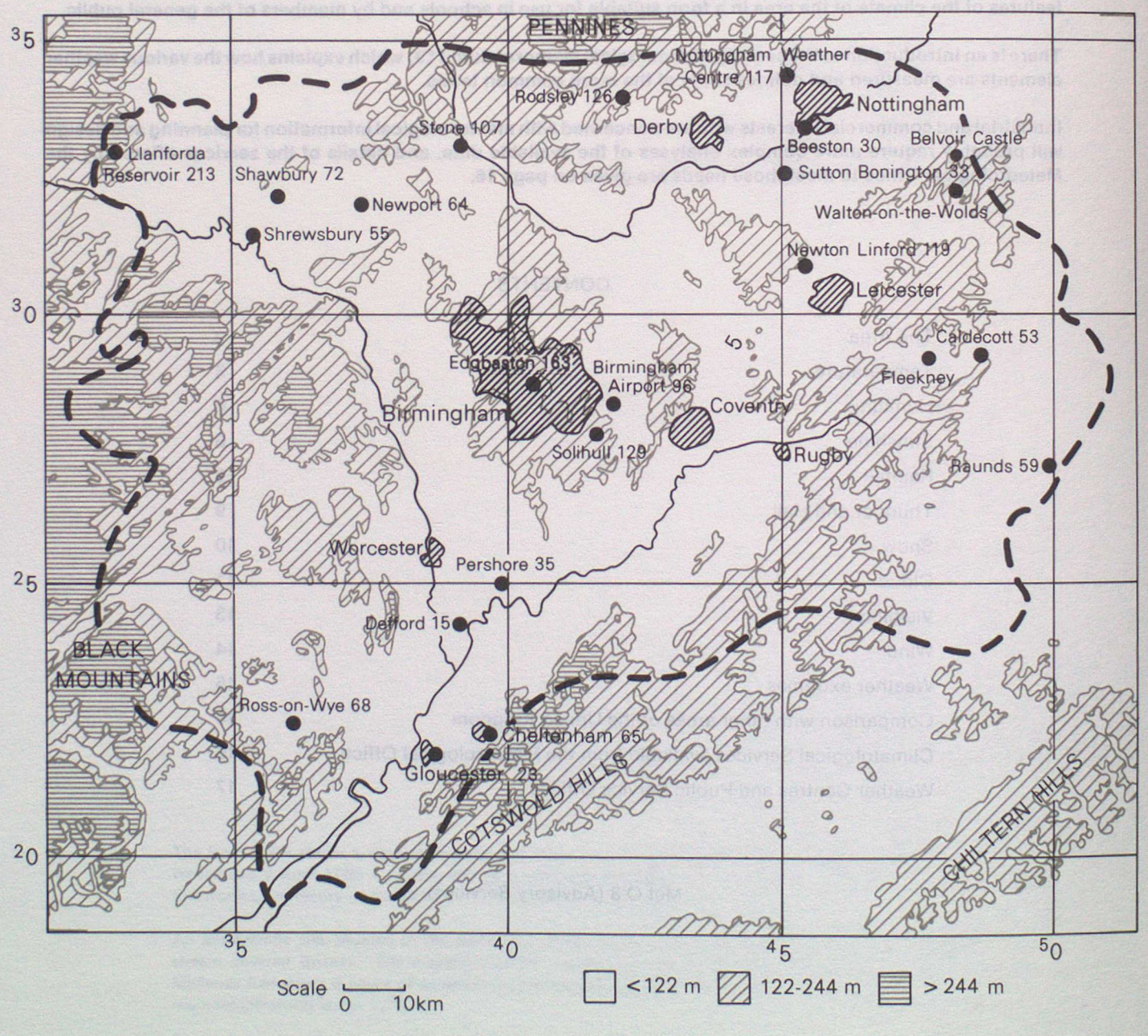
THE AREA

The Midlands area is bounded by the Welsh mountains to the west, the Cotswolds (and their northward extension) to the south, the high ground of the southern Pennines to the north and includes the Northamptonshire uplands in the east. It comprises the Severn and Avon valleys with their rivers flowing to the south and the Trent valley trending from west to east across the northern part of the region. Between these valleys is the Birmingham plateau. The Severn and Avon valleys combine in the Vale of Evesham which, with its rich alluvial soil, is noted for its fruit-growing industry. To the west of the River Severn are the foothills of the Welsh mountains – broken country of sandstone hills and valleys supporting dairy and cattle farming. The ground rises to about 540 metres in the Clee hills. To the south and east of the River Avon the limestone uplands of the Cotswolds rise in a steep escarpment in the south, extending in more gentle slopes into Northamptonshire and Leicestershire. In the centre of the region is the plateau, altitude about 100–150 metres, of Birmingham and the Black Country, the main industrial part of the region. To the north and east of this plateau are the upper reaches of the Trent valley with its industrial towns of Nottingham and Derby, and the Nottingham coalfield in the east.

The map below shows the topography of the region and the locations of the climatological and rainfall stations for which data are given in this memorandum.

Details of the northern section of this region are also included in Climatological Memorandum 131 – The Trent Valley.

Topography of the Midlands and locations and altitudes (in metres) of the stations. Co-ordinates are National Grid references.



TEMPERATURE

Mean annual temperatures over the region vary from around 9 °C to just over 10 °C. The highest values occur in the lower parts of the Severn valley while the lowest values tend to occur at the higher altitude locations. Over the British Isles mean annual temperatures range from about 7 °C over the Shetlands to over 10 °C in the extreme south-west of England and the Channel Islands.

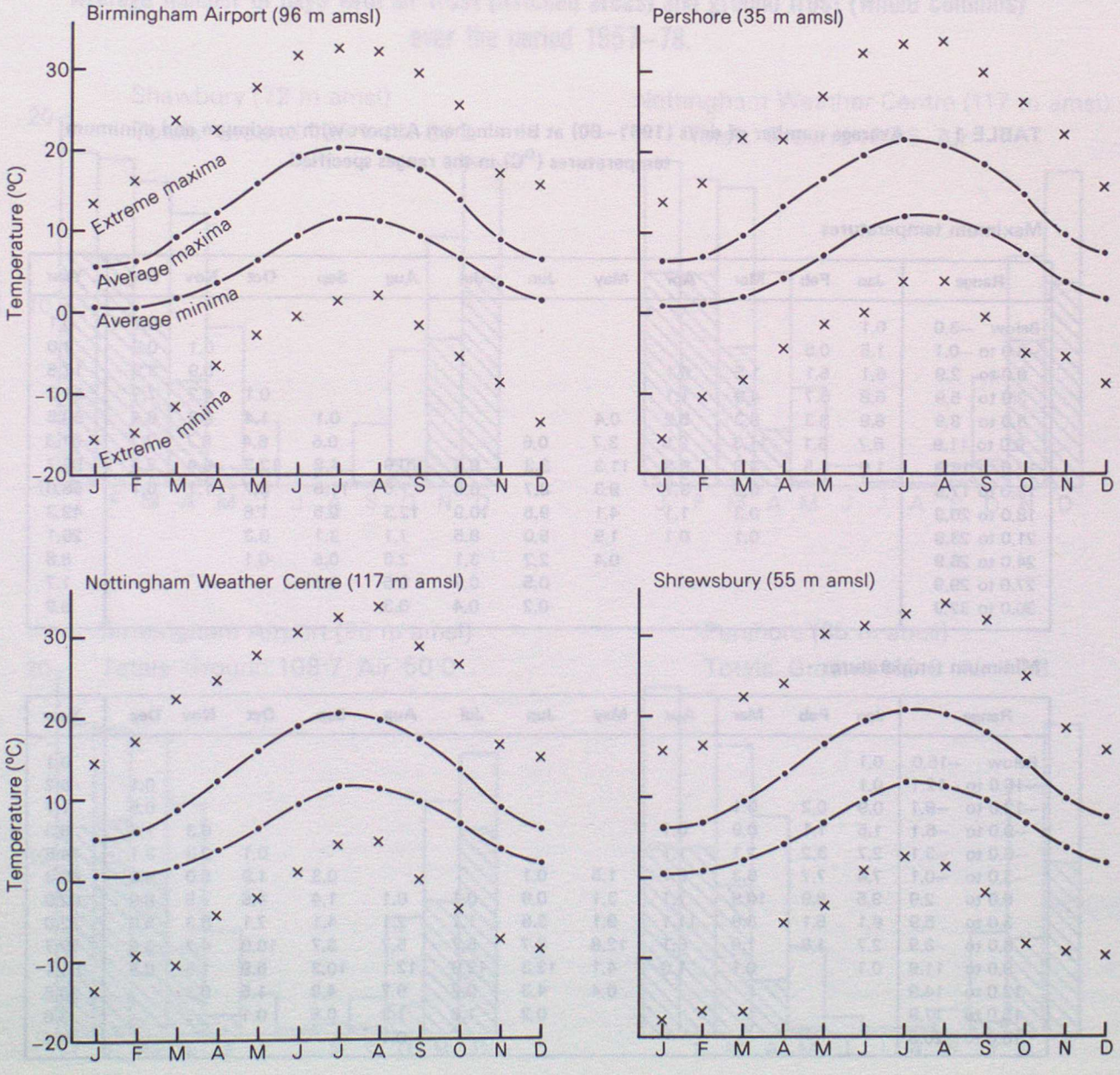
Temperatures show both a seasonal and diurnal variation. Minimum temperatures usually occur around sunrise and maximum temperatures normally two or three hours after midday. January is the coldest month in the Midlands with mean minimum temperatures varying from just below 0 °C to over 1.5 °C. This compares with −1.0 °C in parts of Tayside and Grampian region to over 5.5 °C in the Isles of Scilly. The higher values in the region occur in the lower Severn valley and are due to the incursion of milder maritime air via the Bristol Channel.

Extreme minimum temperatures usually occur in January with the absolute minimum for the region of −26.1 °C at Newport, Shropshire in January 1982.

July is the warmest month with mean maximum temperatures as high as 21.5 °C. The highest mean July temperatures in Great Britain occur in the London area at 22.5 °C whilst the lowest of around 15 °C occur in the Shetlands. Extreme maximum temperatures occur in July or August. During the heat wave of 1976 Cheltenham had the highest July temperature ever recorded in Great Britain with 35.9 °C on the 3rd. On 9 August 1911 the highest recorded United Kingdom temperature of 36.7 °C occurred at Raunds, Northamptonshire and also at Epsom and Canterbury.

The variation of mean maximum and mean minimum temperatures together with extreme temperatures recorded at four locations in the region are shown in the diagrams below.

Annual variation of maximum and minimum temperatures over the period 1941-70 with extreme temperatures for periods up to 1978.



There is a marked similarity between the curves of mean values but more variation in the extremes which reflect the differing topography of the locations as well as the period over which the data have been recorded.

Table 1 gives the average number of days each month of maximum and minimum temperatures at Birmingham Airport in specified ranges. The most striking feature of the table is the wide range of both maximum and minimum temperatures at any time of year. From the table it can be seen that at Birmingham Airport the temperature reaches or exceeds 30 °C about one day per year and fails to rise above freezing on about three days a year.

Table 2 compares the number of days of high and low temperatures at four locations in the region. Pershore has more occasions of high temperatures than the other locations owing to its lower altitude and local topographical effects. Shawbury has most instances of low temperatures while Nottingham Weather Centre has fewest, this being due in part to topographical differences between the two sites.

The average number of days of air frost varies in the region from about 40 in the lower Severn valley to over 60 a year in sheltered areas to the lee of the Welsh mountains. Ground frosts occur on average on 100 to 120 days each year.

The diagram opposite shows the frequency of air frost and ground frost at four locations in the region. This shows that a ground frost may occur at any time of year but the summer months are usually free of air frost. Nottingham Weather Centre has not had an air frost in the months from June to September since records began in 1948. There are great variations within these figures; for instance, in the period 1956–80 the number of days of air frost at Pershore varied from 19 in 1974 to 81 in 1963.

TABLE 1 **Average number of days (1961–80) at Birmingham Airport with maximum and minimum temperatures (°C) in the ranges specified**

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Below –3.0	0.1											0.1	0.1
–3.0 to –0.1	1.5	0.6									0.1	0.9	3.0
0.0 to 2.9	6.1	5.1	1.5	0.1							0.9	3.9	17.5
3.0 to 5.9	6.8	6.7	4.9	1.1						0.1	4.2	7.7	31.3
6.0 to 8.9	8.9	8.3	8.3	5.2	0.4				0.1	1.4	9.6	8.4	50.5
9.0 to 11.9	6.7	6.1	11.3	9.5	3.7	0.6			0.5	6.4	8.7	7.7	61.3
12.0 to 14.9	1.0	1.5	3.8	9.3	11.3	3.3	0.8	0.9	4.8	12.3	5.4	2.3	56.7
15.0 to 17.9			0.9	3.7	9.3	8.7	6.6	7.5	11.5	8.7	1.1	0.1	58.0
18.0 to 20.9			0.3	1.1	4.1	9.5	10.9	12.3	9.5	1.8			49.3
21.0 to 23.9			0.1	0.1	1.9	5.0	8.5	7.1	3.1	0.3			26.1
24.0 to 26.9					0.4	2.2	3.1	2.6	0.5	0.1			8.8
27.0 to 29.9						0.5	0.7	0.5	0.1				1.7
30.0 to 32.9						0.2	0.4	0.3					0.9

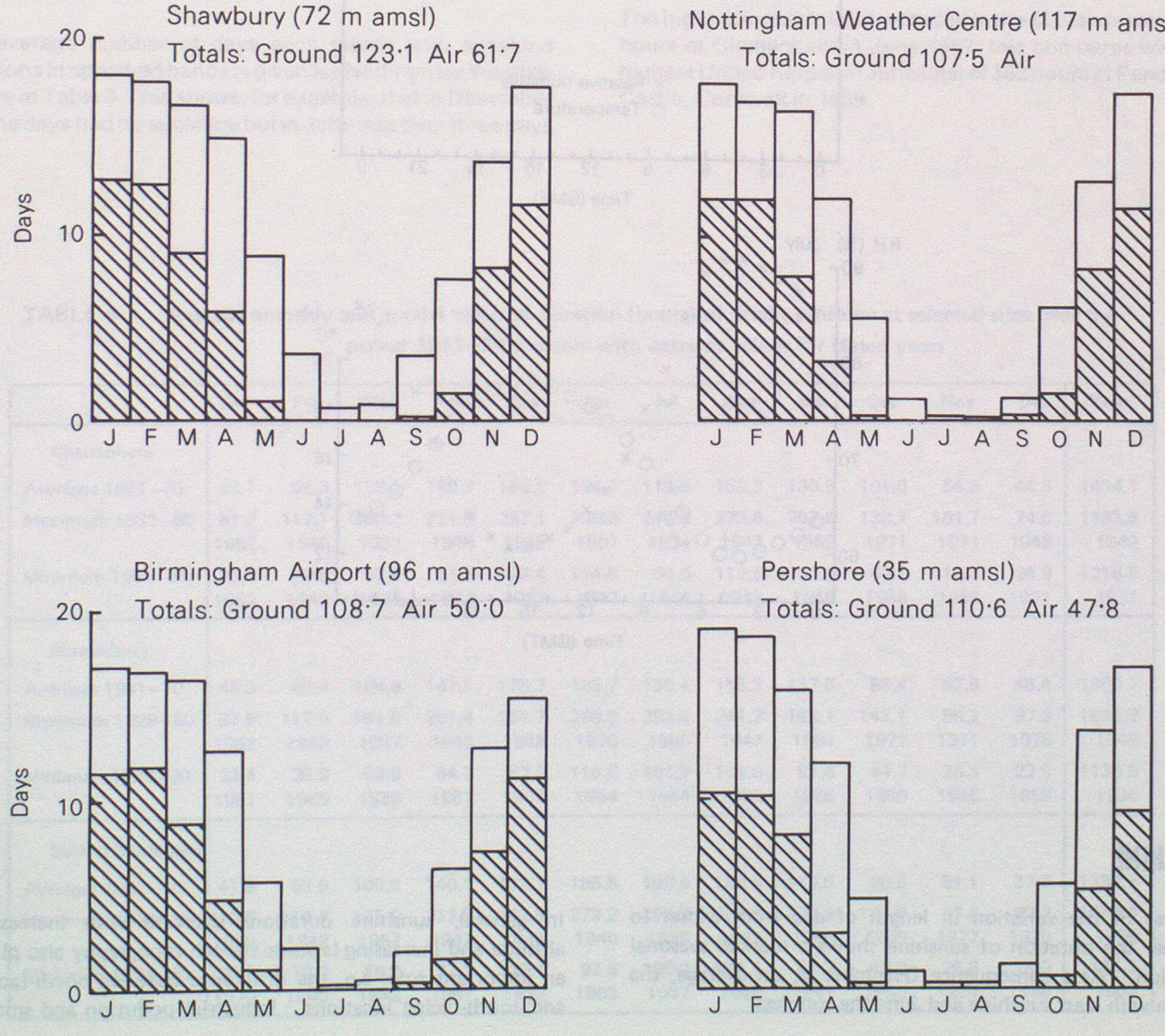
Minimum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Below –15.0	0.1												0.1
–15.0 to –12.1	0.1											0.1	0.2
–12.0 to –9.1	0.9	0.2	0.1									0.5	1.7
–9.0 to –6.1	1.5	1.1	0.9	0.1							0.3	1.5	5.3
–6.0 to –3.1	2.7	3.2	2.1	1.1						0.1	2.3	3.1	14.6
–3.0 to –0.1	7.4	7.7	6.3	3.7	1.5	0.1			0.3	1.9	5.0	6.6	40.3
0.0 to 2.9	9.5	8.9	10.9	7.1	3.1	0.9	0.1	0.1	1.4	4.5	7.5	8.9	62.9
3.0 to 5.9	6.1	5.1	8.6	11.1	9.1	3.6	1.1	2.1	4.1	7.1	8.3	5.8	72.0
6.0 to 8.9	2.7	1.9	1.9	6.1	12.8	8.7	5.7	5.7	8.7	10.0	4.7	3.8	72.7
9.0 to 11.9	0.1		0.1	1.0	4.1	12.3	12.9	12.1	10.3	5.9	1.5	0.8	61.1
12.0 to 14.9					0.4	4.3	9.7	9.7	4.8	1.5	0.3		30.5
15.0 to 17.9						0.2	1.6	1.3	0.5	0.1			3.6
18.0 to 20.9								0.1					0.1

TABLE 2 Average number of days (1957–78) with maximum and minimum temperatures exceeding certain limits at selected sites in the Midlands

Maximum temperature	25.0 °C or more						30.0 °C or more			
	May	Jun	Jul	Aug	Sep	Oct	Jun	Jul	Aug	Sep
Birmingham A/P	0.1	2.2	2.6	2.5	0.5	0.1	0.2	0.4	0.2	
Nottingham W.C.	0.4	2.8	2.9	3.5	0.6	0.1	0.3	0.6	0.2	
Shawbury	0.1	2.1	2.1	2.2	0.4	<0.1	0.1	0.3	0.2	
Pershore	0.1	2.8	3.8	3.7	0.9	0.1	0.3	0.5	0.4	0.1
Minimum temperature	**Less than −5.0 °C**						**Less than −10.0 °C**			
	Nov	Dec	Jan	Feb	Mar	Apr	Dec	Jan	Feb	Mar
Birmingham A/P	0.7	2.8	2.7	1.9	1.7	0.1	0.2	0.6	0.1	0.1
Nottingham W.C.	0.1	1.5	1.9	1.1	0.5			0.2	0.1	<0.1
Shawbury	0.9	3.1	3.0	2.0	1.4	0.1	0.4	0.9	0.2	0.1
Pershore	0.5	2.6	2.5	1.0	1.4		0.1	0.6	0.1	<0.1

Average number of days with air frost (hatched areas) and ground frost (whole columns) over the period 1957–78.



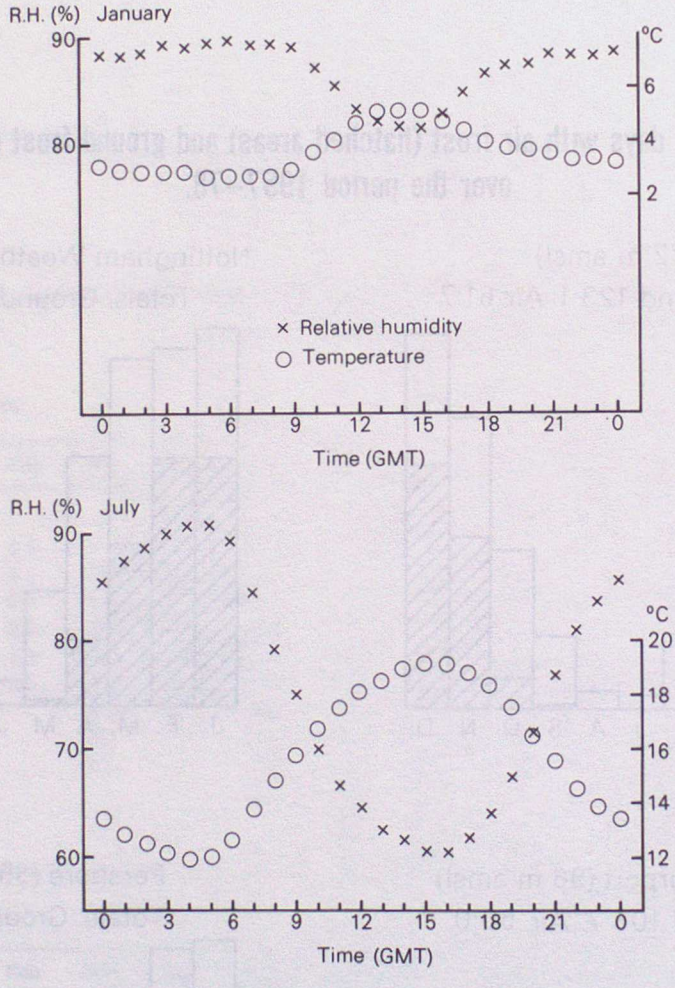
HUMIDITY

Relative humidity, expressed as a percentage, is a measure of the amount of water vapour in the air compared to the maximum amount of water vapour which could be contained by the air at the same temperature. If the amount of water vapour remains constant, then as the temperature rises (or falls) the relative humidity decreases (or increases).

Relative humidity averages around 80 per cent over the year with higher values in winter than summer and at night than by day. This is primarily a reflection of the seasonal and diurnal temperature changes. Relative humidities equal or exceed 95 per cent for about 20 per cent of the time in the Midlands and 100 per cent can be reached in fog and during persistent rain or drizzle. Low relative humidities are less common. The lowest value ever recorded in Great Britain was 4 per cent at both Manchester Airport and Great Dun Fell, Cumbria on 29 March 1965.

The diagram below shows the average diurnal variation of temperature and relative humidity at Birmingham Airport for the months of January and July. This illustrates many of the points made in the text.

Average diurnal variation of temperature and relative humidity at Birmingham Airport for January and July over the period 1957–78.



SUNSHINE

Because of the variation in length of day from winter to summer the duration of sunshine shows a marked seasonal variation. As a consequence December is, on average, the month with least sunshine and June the sunniest.

In general, sunshine durations decrease with increasing altitude and increasing latitude though topography also plays an important role, e.g. the difference between north-facing and south-facing locations. Industrial pollution and smoke

TABLE 3 Average number of days of sunshine duration at Nottingham Weather Centre during the period 1957–78

(Frequency of occurrence in each 3-hour band in each month)

Duration (Hours per day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
No sunshine	14.7	11.0	7.4	4.6	2.3	2.8	2.4	2.7	4.1	7.8	11.8	15.6	87.3
0.1 to 3.0	10.8	9.9	10.9	10.3	9.5	7.1	9.9	9.6	10.1	11.3	10.1	9.9	119.1
3.1 to 6.0	4.8	4.9	6.7	6.6	6.6	5.1	7.7	6.8	7.2	7.2	5.8	5.3	74.9
6.1 to 9.0	0.7	2.5	5.0	5.6	5.5	5.4	4.7	6.2	5.8	4.5	2.3	0.3	48.2
9.1 to 12.0			1.0	2.6	4.4	4.5	3.9	4.3	2.7	0.2			23.5
More than 12.0				0.2	2.7	5.2	2.5	1.4					12.1

haze can also reduce sunshine amounts but, since the introduction of the Clean Air Act, there has been an increase in sunshine durations over the industrial Midlands.

Average annual sunshine totals over the Midlands range from around 1250 hours to just over 1450 hours and reflect the influence of altitude and topography as well as that of industrial pollution. These figures compare with values of less than 1100 hours in the Shetland Islands to over 1750 hours along the south coast of England. The sunniest place in Great Britain is St Helier, Jersey with an annual average over the period 1951–80 of 1928 hours.

The average number of days each month with sunshine durations in specified bands is given for Nottingham Weather Centre in Table 3. This shows, for example, that in December half the days had no sunshine but in June less than three days had none. This is due, in part, to the differences in the length of day as well as to the weather types which predominate in these months.

Table 4 lists the average monthly and annual sunshine totals for the period 1941–70 for three locations plus the highest and lowest monthly totals for periods up to 1980. In recent years the lowest monthly total of sunshine was at Nottingham in December 1956 with 10.4 hours. The absolute minimum in Great Britain was in December 1890 at Westminster when no sunshine at all was recorded.

The highest monthly total recorded in the Midlands was 308.5 hours at Cheltenham in June 1957; this compares with the highest United Kingdom June total of 382 hours at Pendennis Castle, Cornwall in 1929.

TABLE 4 Average monthly and annual totals of duration (hours) of bright sunshine at selected sites over the period 1941–70 together with extreme values for stated years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Cheltenham													
Averages 1941–70	45.1	66.3	115.1	155.3	186.1	196.7	175.6	163.3	130.5	101.0	54.5	44.6	1434.1
Maximum 1931–80	81.2	117.1	180.7	211.5	257.1	308.5	276.2	276.4	207.8	138.7	101.7	74.6	1733.6
	1952	1949	1933	1948	1948	1957	1934	1947	1959	1971	1971	1948	1949
Minimum 1931–80	26.7	22.8	52.4	81.3	98.4	124.6	96.6	112.5	54.6	60.1	18.5	24.9	1215.5
	1953	1940	1942	1961	1932	1977	1944	1948	1945	1968	1945	1971	1931
Shrewsbury													
Averages 1941–70	49.3	66.4	104.9	147.1	178.7	188.7	165.4	155.3	117.6	88.4	52.5	46.4	1360.7
Maximum 1929–80	87.5	112.5	161.6	201.4	251.7	298.0	283.9	244.7	169.1	143.1	89.3	97.3	1635.2
	1952	1949	1967	1945	1948	1970	1955	1947	1954	1971	1971	1976	1949
Minimum 1929–80	23.4	26.9	52.9	64.7	82.2	116.8	101.7	102.8	81.5	44.3	25.3	22.9	1135.8
	1961	1965	1936	1961	1932	1954	1944	1980	1956	1960	1945	1958	1936
Sutton Bonington													
Averages 1941–70	41.9	63.6	100.6	140.1	178.1	186.5	168.5	153.8	119.6	90.5	51.1	37.8	1332.1
Maximum 1924–80	78.8	116.7	175.0	213.9	242.9	272.2	255.9	252.6	177.9	143.8	97.6	62.7	1640.4
	1959	1949	1967	1942	1943	1940	1935	1947	1964	1959	1977	1929	1959
Minimum 1924–80	20.9	19.2	46.0	77.2	92.1	93.9	106.3	101.1	64.2	47.0	26.6	16.0	1134.1
	1970	1940	1942	1961	1932	1953	1937	1948	1941	1960	1934	1958	1968

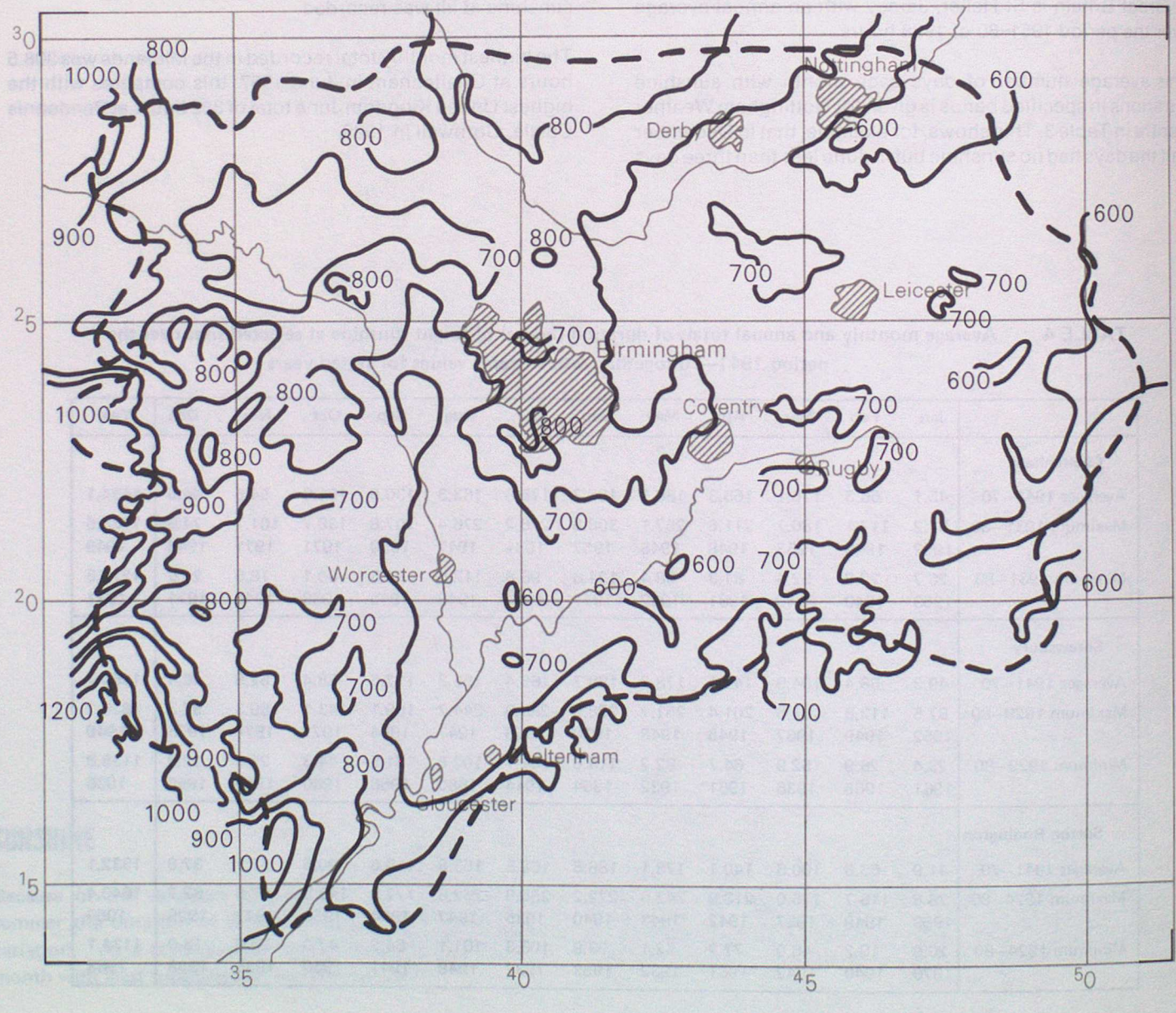
RAINFALL

The distribution of rainfall over the United Kingdom is very much influenced by topography with the largest values occurring over the more mountainous regions and the smallest in the low-lying regions. In this text rainfall includes snow, sleet and hail in addition to rain as well as the small amounts from dew, hoar-frost and rime.

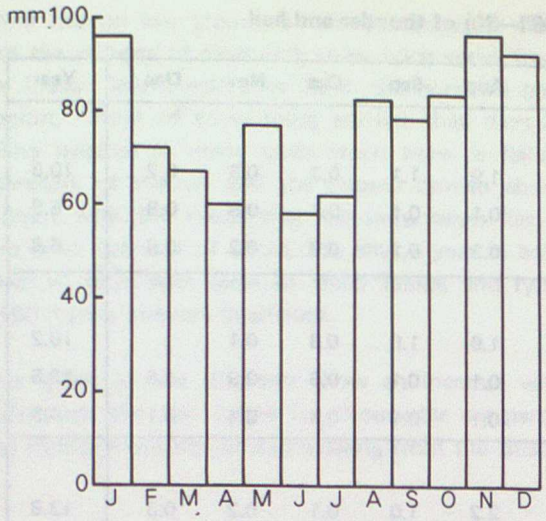
The nature of this rainfall varies during the year. In summer, rainfall is often of a showery nature falling over short periods and is normally more intense than winter rainfall which tends to be more frontal in character with falls occurring over longer periods. As a rough guide an average day of steady rain gives 10 to 15 mm and a heavy thunderstorm lasting an hour or so 25 to 50 mm. 25 mm of rainfall is equivalent to about 200 tonnes of water on a football pitch.

The diagram below shows the average annual rainfall over the Midlands region. The influence of topography on rainfall is clearly seen. The next diagram shows the monthly variation of rainfall for four locations in the region. These are typical of the region as a whole with August and November the wettest months and the period February to April the driest. Over the British Isles generally December and January are the wettest months and February to April the driest.

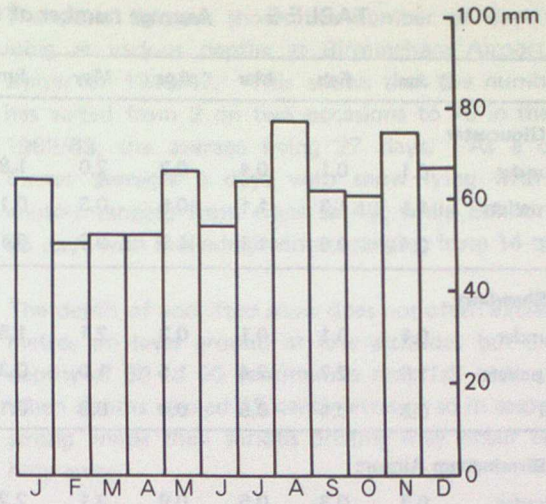
Average annual rainfall (mm) over the period 1941–70. Co-ordinates are National Grid references.



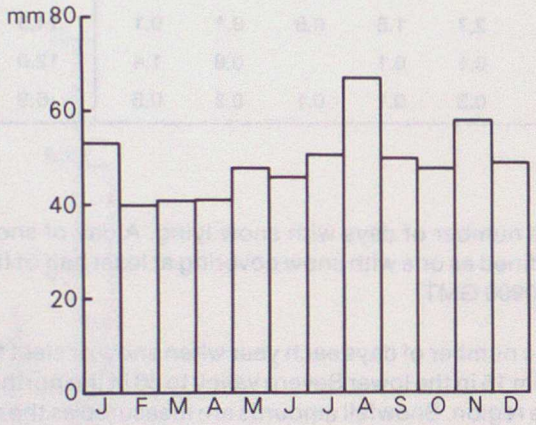
Average monthly rainfall (mm) over the period 1941–70.



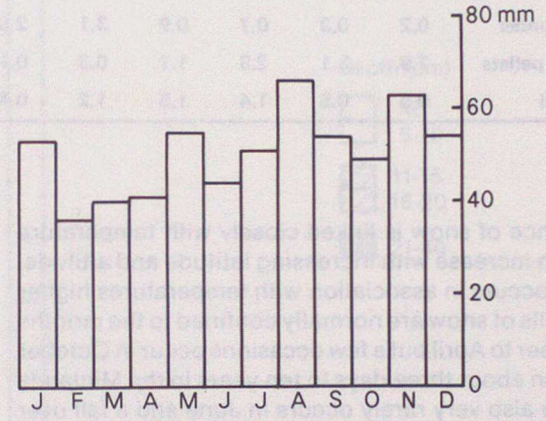
Llanforda Reservoir (213 m amsl)
(AAR 938 mm)



Solihull (129 m amsl)
(AAR 744 mm)



Beeston (30 m amsl)
(AAR 592 mm)



Defford (15 m amsl)
(AAR 606 mm)

amsl = above mean sea level AAR= Annual average rainfall

THUNDER AND HAIL

Thunder and hail are both phenomena associated with cumulonimbus clouds, which are clouds of great vertical extent. A typical thundercloud reaches 18 000 feet and in summer may occasionally exceed 40 000 feet over the British Isles. Thunder is caused by the sudden heating and expansion of air along the path of the lightning.

Thunder an occur at any time of year but is more frequent during the summer months. In the Midlands region the number of days with thunder varies from around 10 in the Severn and Avon valleys to over 15 in the eastern part of the region. Thunder occurs most frequently in the British Isles over the Trent river basin and the southern part of the Vale of York with over 20 days a year on average. The majority of thunderstorms are triggered by convective processes either overland in summer or over a comparatively warm sea in winter.

In thunderstorms or heavy showers at any time of year the precipitation may be of hail or ice pellets. Both are in the form of hard, clear or opaque ice, the criterion between them being one of size. Hail has a diameter of 5 millimetres or more and ice pellets a diameter of less than 5 millimetres. Hail tends to have a maximum occurrence during the spring as it generally melts before reaching the ground in summer. Ice pellets are essentially a winter phenomenon occurring more frequently around coasts. Table 5 gives the average number of days of thunder and hail by month and year for four locations in the region.

Although hail and thunder can occur simultaneously most thunderstorm precipitation is of rain and the heaviest falls of rain over the British Isles are often associated with summer thunderstorms. Two of the most notable falls since 1900 over the Midlands were in thundery situations. On 11 June 1970, 67 mm (2.64 inches) of rain fell at Pershore, Hereford and Worcester in 25 minutes and 152 mm (5.97 inches) fell at Rodsley, Derbyshire in eight hours on 5 August 1957 which just happened to be a bank holiday. The largest ever fall of rain in a 24-hour period over the British Isles was also in a thundery situation when 279 mm (11 inches) were recorded at Martinstown, Dorset on 18 July 1955.

TABLE 5 Average number of days (1961–80) of thunder and hail

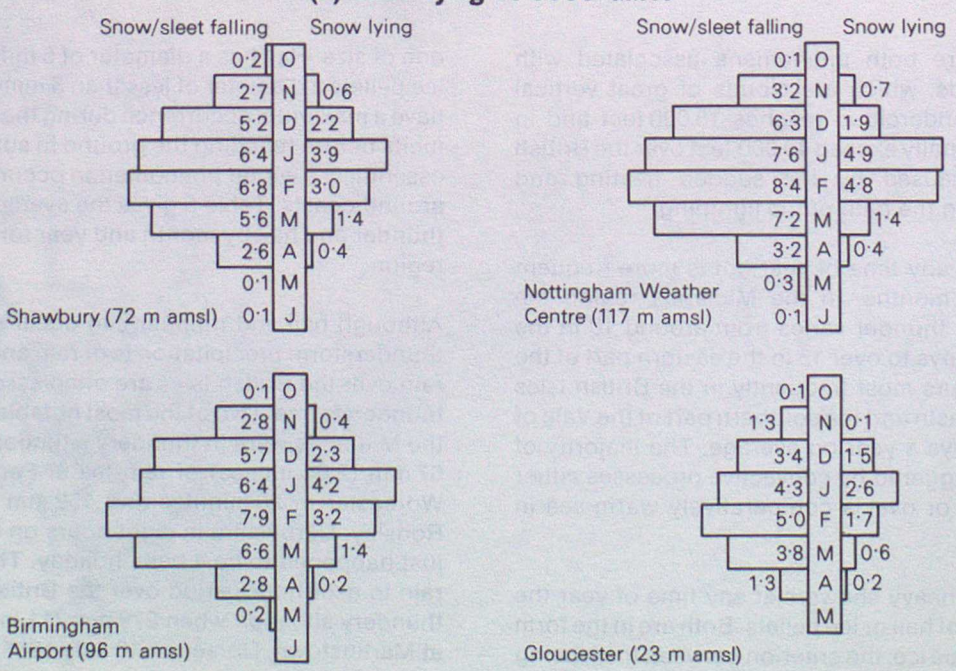
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Gloucester													
Thunder	0.1	0.1	0.4	0.3	2.0	1.8	1.8	1.9	1.1	0.3	0.3	0.2	10.5
Ice pellets	1.1	1.3	1.1	0.5	0.3	0.1		0.1	0.1	0.1	0.5	0.8	5.9
Hail	0.4	0.6	1.1	1.9	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.6	6.8
Shawbury													
Thunder	0.1	0.1	0.1	0.3	2.1	1.5	2.5	1.9	1.0	0.3	0.1		10.2
Ice pellets	1.9	2.7	2.4	1.5	1.0	0.3		0.1	0.1	0.5	0.9	1.5	12.5
Hail	0.3	0.4	0.5	0.9	0.9	0.1	0.1	0.1	0.1	0.3	0.4	0.1	4.3
Birmingham Airport													
Thunder	0.3	0.3	0.5	0.9	3.1	2.2	2.7	2.2	1.0	0.1	0.2	0.3	13.8
Ice pellets	1.3	2.9	1.8	0.7	0.3	0.1		0.1	0.1	0.1	0.3	1.3	8.8
Hail	0.3	0.6	1.3	1.1	1.1	0.3	0.1	0.3	0.1	0.3	0.4	0.5	6.3
Nottingham Weather Centre													
Thunder	0.2	0.3	0.7	0.9	3.1	2.3	2.5	2.7	1.6	0.5	0.1	0.1	14.9
Ice pellets	2.9	3.1	2.3	1.1	0.3	0.1	0.1	0.1	0.1		0.8	1.4	12.0
Hail	0.5	0.5	1.4	1.5	1.2	0.4	0.2	0.3	0.1	0.1	0.3	0.5	6.9

SNOW

The occurrence of snow is linked closely with temperature and shows an increase with increasing latitude and altitude. Snow rarely occurs in association with temperatures higher than 4 °C. Falls of snow are normally confined to the months from November to April but a few occasions occur in October and May — on about three days in ten years in the Midlands region. Snow also very rarely occurs in June and a fall over the Midlands on 2 June 1975 was the first recorded in summer since 1888. The diagram below shows, for four locations, the number of days with snow or sleet falling and the number of days with snow lying. A day of snow lying is defined as one with snow covering at least half of the ground at 0900 GMT.

The number of days each year when snow or sleet falls varies from 15 in the lower Severn valley to 30 in the northern part of the region. Snowfall amounts are measured as the equivalent water content and are included as such in the rainfall statistics. As a rough guide 12 centimetres of fresh snow is equivalent to 1 centimetre of rainfall.

Average number of days per month at selected sites over the period 1961–78 with (a) snow/sleet falling and (b) snow lying at 0900 GMT.



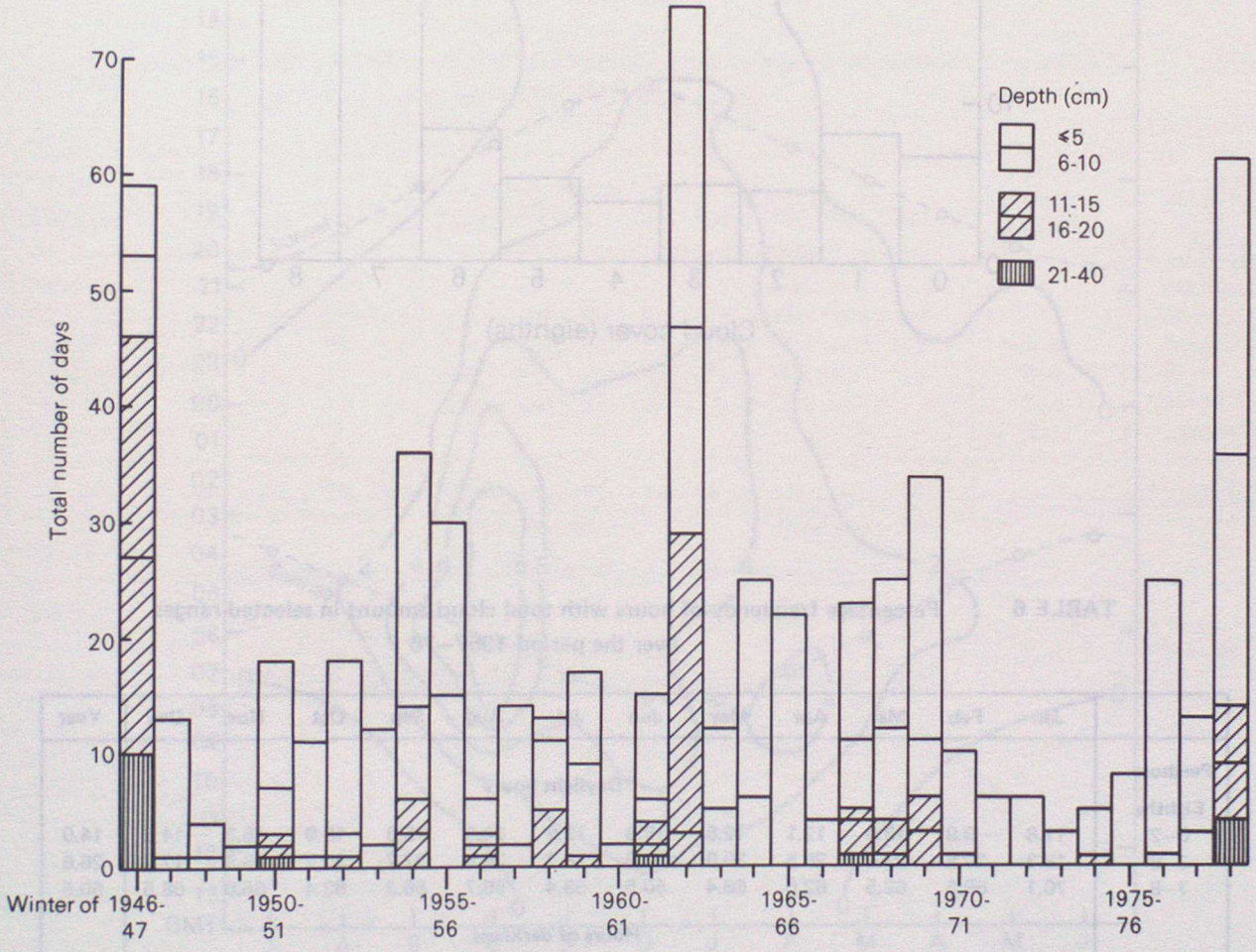
Snow rarely lies on low ground before December or after March and the number of days with snow lying varies from 12 in the lower Severn valley to 20 in the northern part of the region. Days of snow lying are less than days of snow falling because in many cases when snow is falling the temperature of the air and the ground remain above freezing point with the result that the snow never lies at all. There is an increase of about five days a year in both the number of days with sleet or snow falling and lying for each 100 metres increase in altitude.

The values given in the diagrams show an increase with altitude although the low values for Gloucester are partly a result of milder maritime air encroaching from the Bristol Channel.

The other diagram shows the number of days with snow lying at various depths at Birmingham Airport since the winter of 1946/47. This shows that the number of days has varied from 2 on two occasions to 75 in the winter of 1962/63, the average being 27 days. As a comparison Exeter averages 5 days with snow lying with individual winters ranging from none to 40, while Balmoral averages 60 days with individual winters ranging from 14 to 102 days.

The depth of undrifted snow does not often exceed 15 centimetres on level ground at low altitudes but on occasions depths of 30 to 60 centimetres may fall over a wide area. When depths exceed 15 centimetres or so in association with strong winds then serious drifting may occur especially in hilly areas.

Number of days with total snow depth at 0900 GMT in stated ranges at Edgbaston



CLOUD

Clouds are collections of very small water droplets, ice or a mixture of both. They are formed mainly as a result of cooling of air caused by ascent, as in convection, forced lifting over high ground, or in large-scale upward motions associated with fronts and depressions.

Cloud amounts are estimated as the fraction, in eighths, of the sky covered by cloud, with the figures 0 and 8 representing a completely clear and cloudy sky respectively. In this section the cloud ranges 0–2, 3–6 and 7–8 eighths will be used to approximate to clear skies, partly cloudy and cloudy respectively.

The diagram on page 12 shows the percentage frequency throughout the year for cloud amounts at Birmingham Airport. The values are typical of the Midland region with cloudy skies predominating. Over the country as a whole the values show a similar pattern.

Table 6 gives the percentage frequency by month and year for the hours of daylight and darkness for the three cloud ranges at Pershore and Shawbury. These are typical of the region, being more cloudy in winter than in summer and more cloudy by day than by night. June is the least cloudy month both by day, as reflected in the sunshine totals, and by night. Pershore has the greater incidence of clear skies of the two owing to its topography and lower altitude.

Frequency of total cloud amount at Birmingham Airport over the period 1957–76.

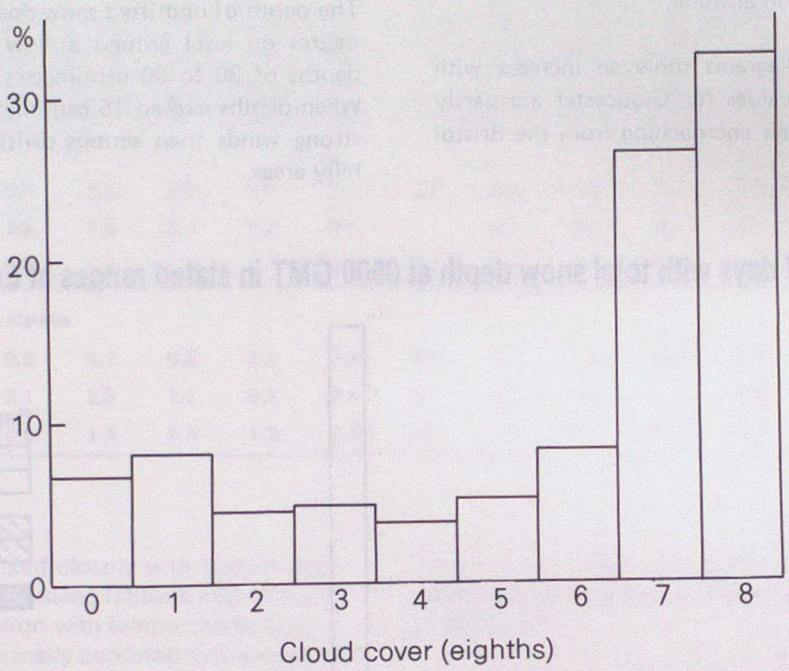


TABLE 6 Percentage frequency of hours with total cloud amount in selected ranges over the period 1957–76

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Pershore							**Daylight hours**						
Eighths													
0–2	11.8	9.9	13.9	12.1	12.5	18.8	12.9	14.6	15.8	13.9	15.3	14.5	14.0
3–6	18.3	20.8	23.4	25.5	30.9	30.6	28.7	28.8	27.7	22.7	19.9	17.2	25.6
7–8	70.1	69.5	62.5	62.6	56.4	50.5	58.4	56.7	56.3	63.4	65.0	68.5	60.5
							Hours of darkness						
0–2	20.1	21.5	28.3	30.0	29.7	32.0	26.4	32.0	31.5	26.5	25.9	21.4	26.4
3–6	14.4	15.8	17.8	20.0	24.1	23.5	27.1	23.3	21.4	17.1	16.0	14.6	18.8
7–8	65.3	62.7	54.1	50.2	46.1	44.5	46.7	44.6	46.9	56.3	57.9	64.1	55.0
Shawbury							**Daylight hours**						
0–2	10.6	8.9	11.3	10.3	10.0	17.0	8.4	11.2	10.5	9.9	12.8	13.3	11.1
3–6	19.9	21.4	26.7	30.4	34.2	31.7	32.9	31.3	31.2	26.0	23.8	21.5	28.6
7–8	69.5	69.7	61.9	59.1	55.9	51.4	58.7	57.6	58.3	64.2	63.4	65.3	60.2
							Hours of darkness						
0–2	17.5	17.8	22.2	25.1	22.1	26.2	19.5	24.5	25.7	19.3	20.8	18.4	21.0
3–6	17.5	20.2	21.2	24.3	30.6	28.7	28.3	28.5	24.7	22.9	20.9	19.3	23.0
7–8	65.0	61.9	56.6	50.7	47.4	45.2	52.3	47.0	49.5	57.8	58.4	62.3	55.9

VISIBILITY

Visibility is defined as the greatest horizontal distance at which an object can be discerned with the naked eye. It is of considerable importance to the community in general because the operation of various types of transport may be disrupted or stopped altogether if the visibility falls below certain limits. Variations in visibility occur with the different types of precipitation such as rain and snow, as well as with atmospheric pollution due to smoke and dust, but the really poor visibilities are due mainly to fog.

Fog is predominantly a winter phenomenon occurring generally at night or early morning though it does occasionally persist all day. There are a number of factors which affect fog formation and as a consequence there is a wide variation in the number of days when fog occurs at locations throughout the region. Fog and fog formation processes are discussed in the Introduction to the series.

The diagram below shows the distribution of thick fog at Birmingham Airport for each hour of the day throughout the year. This illustrates most of the points made here and in the Introduction to the series about the occurrence of fog.

Table 7 gives the number of days per month and year with fog at 0900 GMT for four locations. This shows the wide variations which can occur over relatively short distances.

Percentage of time with visibility less than 200m at Birmingham Airport over the period 1957–78.

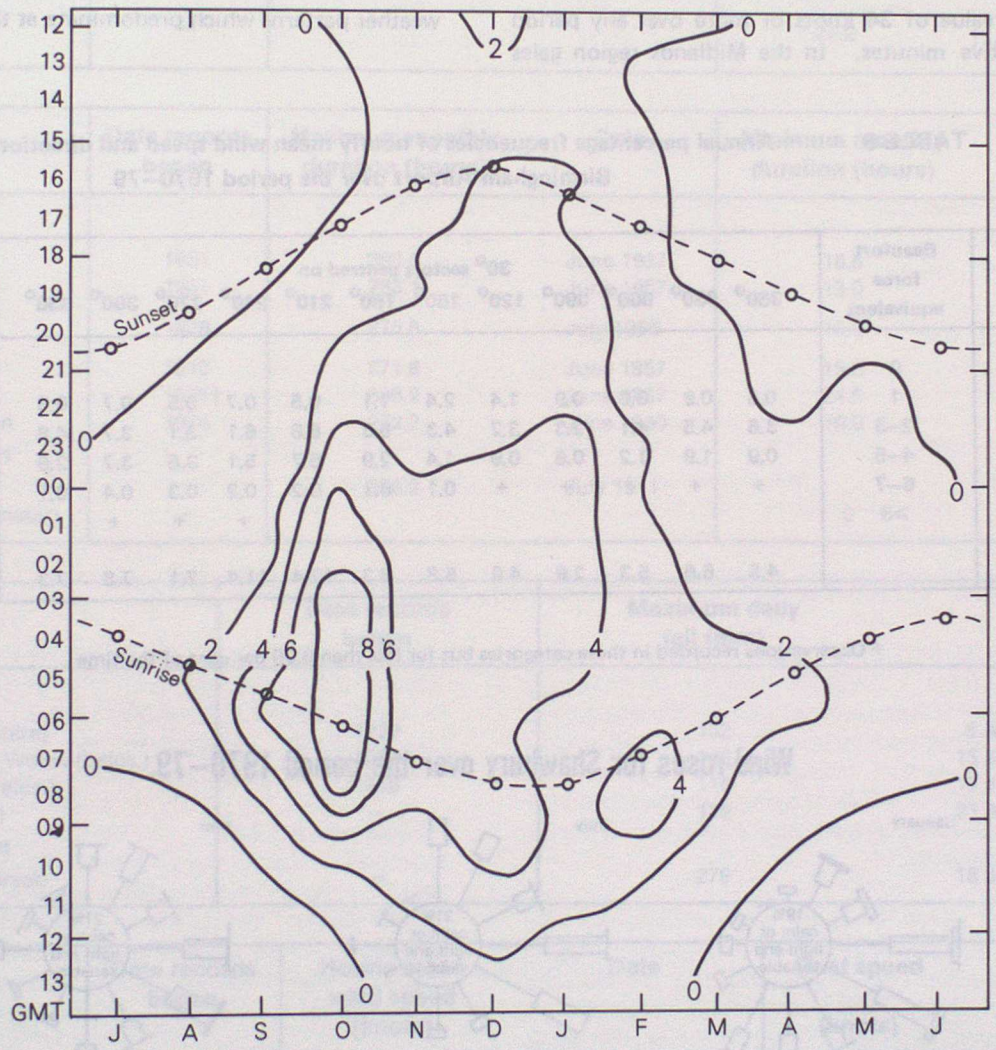


TABLE 7 **Average number of days in each month and the year with visibility of less than 1000 metres at 0900 GMT at selected sites in the Midlands over the period 1961–78**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Newport	2.4	1.3	1.2	0.3		0.1		0.2	1.2	2.5	1.6	2.1	12.9
Newtown Linford	3.5	3.3	1.9	0.8	0.2	0.2	0.1	0.1	0.6	3.3	3.0	3.3	20.3
Caldecott	4.2	4.7	3.5	0.8	0.7	0.1	0.1	0.1	2.1	5.4	3.6	4.4	30.2
Stone	5.2	4.3	2.9	1.4	0.2	0.4	0.6	1.4	2.9	5.7	4.7	6.4	35.6

WIND

The wind direction is that from which the wind blows, given either as a compass point or in degrees clockwise from the north. Wind speeds are measured in knots (1 knot = 1.15 mph, 1 metre per second = 1.94 knots) and are closely related to the pressure distribution. The strongest winds are associated with the passage of depressions across or close to the British Isles. As the frequency of depressions is greatest during the winter months this is when the strongest winds normally occur.

Wind seldom occurs as a smooth flowing airstream and eddies give variations both in direction and speed. Winds are usually stronger by day than by night because of the increased turbulence caused by the temperature rise making the wind more gusty and average speeds higher.

A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of ten consecutive minutes. In the Midlands region gales occur on about two days a year on average but nearer to five days in the more exposed lower Severn valley and over high ground.

Table 8 gives the percentage annual frequency of wind speeds in Beaufort force ranges against 30-degree directions of wind for Birmingham Airport for the years 1970–79. This distribution is reasonably typical of the region. Although it cannot be deduced from this table, all the occasions of gale-force winds occurred in the months November, December and January.

The wind-roses for four months at Shawbury are shown below to illustrate how the wind varies throughout the year. The predominance of the west to south-westerly winds is evident as is the high frequency of northerly winds in April. The differences between the months are due to the different weather patterns which predominate at these times.

TABLE 8 **Annual percentage frequencies of hourly mean wind speed and direction for Birmingham Airport over the period 1970–79**

Knots	Beaufort force equivalent	30° sectors centred on 360°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	All directions
Calm	0													3.4
1–3	1	0.8	0.9	0.9	0.9	1.4	2.4	1.1	0.5	0.7	0.5	0.7	0.8	13.3
4–10	2–3	3.6	4.5	4.1	2.3	3.2	4.3	5.3	6.6	6.1	3.1	3.7	4.6	51.4
11–21	4–5	0.9	1.9	1.2	0.6	0.9	1.4	2.9	5.7	5.1	3.6	3.7	2.6	30.3
22–33	6–7	+	+	+	+	+	0.1	0.1	0.2	0.2	0.3	0.4	0.1	1.5
≥34	≥8									+	+	+		+
Total ≥4		4.5	6.5	5.3	2.9	4.0	5.8	8.3	12.4	11.4	7.1	7.8	7.3	83.3

+ Observations recorded in these categories but for less than 0.05 per cent of the time

Wind-roses for Shawbury over the period 1970–79.

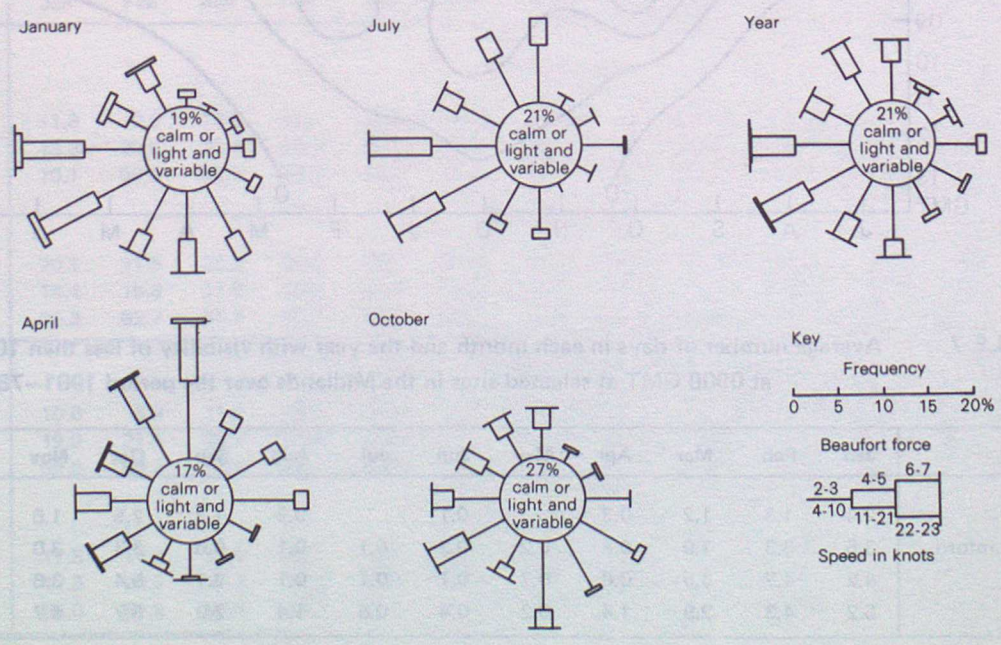


TABLE 9 Weather extremes

TEMPERATURE	Date records began	Maximum daily temperature (°C)	Date	Minimum daily temperature (°C)	Date
Midlands					
Cheltenham	1901	35.9	3 July 1976	−20.1	14 January 1982
Edgbaston	1901*	34.4	9 August 1911	−11.7	21 January 1940
Newport	1928	32.0	3 July 1976	−26.1	10 January 1982
Raunds	1904	36.7	9 August 1911	−18.3	13/14 December 1920
Ross-on-Wye	1914†	32.8	12 July 1923 19 August 1932	−19.4	13 December 1981
Sutton Bonington	1924	32.8	29/30 July 1948 12 August 1953	−16.7	21 January 1940
United Kingdom					
Raunds Epsom Canterbury	—	36.7	9 August 1911		
Braemar	—			−27.2	11 February 1895 10 January 1982

SUNSHINE	Date records began	Maximum monthly duration (hours)	Date	Minimum monthly duration (hours)	Date
Midlands					
Cheltenham	1931	308.5	June 1957	18.5	November 1945
Edgbaston	1931	283.1	June 1957	19.0	January 1960
Newport	1928	278.6	July 1955	15.9	February 1965 December 1956
Raunds	1912	271.8	June 1957	15.3	December 1956
Ross-on-Wye	1931†	306.2	June 1957	24.5	November 1945
Sutton Bonington	1924	272.2	June 1940	16.0	December 1960
United Kingdom					
Eastbourne	—	383.9	July 1911		
London (Westminster)	—			0	December 1890

RAINFALL	Date records began	Maximum daily fall (mm)	Date
Midlands			
Rodsley (Derbyshire)	1929	152	5 August 1957
Waltham-on-the-Wolds (Leics.)	1872	146	15 July 1937
Belvoir Castle (Leics.)	1855	116	15 July 1937
Fleckney (Leics.)	—	112	23 August 1865
United Kingdom			
Martinstown (Dorset)	—	279	18 July 1955

WIND	Date records began	Hourly mean wind speed (knots)	Date	Gust speed (knots)	Date
Midlands					
Birmingham A/P	1961	44	2 January 1976	73	2 January 1976
Edgbaston	1924**	38	16 March 1947 30 November 1954	73	23 November 1938
Shawbury	1972	43	2 January 1976	69	2 January 1976
Nottingham W.C.	1969	38	2 January 1976	71	2 January 1976
United Kingdom					
(Low level sites)					
Shoreham-by-Sea (East Sussex)	—	72	16 October 1987		
Fraserburgh (Grampian Region)	—			123	13 February 1989

Records ceased: *1979 †1975 **1978

TABLE 10 Climatological data for places in the United Kingdom based on the period 1941–70 except where indicated

	Altitude (metres)	Average annual rainfall (mm)	Average daily temperatures (°C) #				Average annual duration of bright sunshine (hours)	Average annual no. of days with*	
			Minimum		Maximum				
			Jan.	July	Jan.	July		Air frost	Snow lying
England									
Abingdon (Oxfordshire)	69	605	0.3	11.6	6.3	21.6	1544	57	13
Acklington (Northumberland)	42	644	0.0	10.3	5.5	17.9	1429	60	20
Birmingham Airport (W. Midlands)	96	679	0.1	11.2	5.7	20.5	1385	62	15
London (Kensington Palace)	25	640	1.7	13.3	6.6	22.2	1384[x]	35	7
Manchester Airport (Gr. Manchester)	75	819	0.5	11.7	5.8	19.6	1334	47	10
Plymouth/Mount Batten (Devon)	27	990	3.1	12.7	8.3	19.0	1678	25	3
Shawbury (Shropshire)	72	670	0.0	11.2	6.0	20.2	1368	63	17
Southsea (Hampshire)	2	702	2.4	13.9	7.1	20.7	1748	25	6
Waddington (Lincolnshire)	68	598	0.1	11.6	5.2	20.3	1503	54	18
Wales									
Cardiff/Wales Airport (S. Glamorgan)	67	947	1.3	11.9	6.6	19.3	1571	36	8
Valley (Gwynedd)	10	871	2.5	12.0	7.5	18.1	1612	27	3
Northern Ireland									
Belfast Airport (Antrim)	68	912	0.6	10.7	6.1	18.1	1281	53	9
Scotland									
Aberdeen Airport (Grampian)	58	872	−0.9	9.6	5.0	17.5	1341	75	30
Balmoral (Grampian)	283	834	−2.8	8.1	3.7	17.4	1120[†]	116	63
Edinburgh Airport (Lothian)	35	677	−0.6	10.3	5.7	18.5	1294	66	14
Lerwick (Shetland)	82	1172	0.6	9.3	5.0	14.0	1067	53	32
Stornoway (Western Isles)	3	1094	1.3	10.1	6.4	15.7	1244	49	11
Glasgow Airport (Strathclyde)	5	991	0.1	10.8	5.8	18.6	1266	58	6

* Based on 1956–70 only.

x For Regents Park.

† For Braemar.

Referring to 24-hour (09–09 GMT) extremes. Adjustments have been made to those stations normally recording night minimum (21–09 GMT) and day maximum (09–21 GMT). See Introduction to the series.

CLIMATOLOGICAL SERVICES AVAILABLE FROM THE METEOROLOGICAL OFFICE

The Meteorological Office collects and archives regular weather reports from a national network of observing stations, consisting of both Meteorological Offices manned by professional staff and co-operating stations operated by interested organizations or individuals. All these data are subjected to close scrutiny before being archived, to ensure consistency of standards, and are then available to meet the needs of the community.

Any undertaking which is at all weather-sensitive can benefit from a prior knowledge of the climate within which it is expected to operate. The building industry can use past weather statistics to estimate likely delays on contracts, architects and civil engineers need to know the likely extremes of weather which a design must withstand, and many industrial processes are dependent on atmospheric conditions for their success. The agricultural industry uses such information for a variety of purposes, many relating to the viability of new crops and the weather-related incidence and spread of pests and diseases.

In addition to special analyses of weather data for these purposes, the Meteorological Office can supply factual statements on weather conditions for legal or insurance purposes.

Enquiries related to aspects of past weather data should be directed to the appropriate address given on the back cover or, if more convenient, initially to your local weather centre (see opposite). Charges for the supply of information depend mainly on the staff time taken to meet the request.

Further information

Information leaflets and brochures describing in more detail the range of specialized services available from the Meteorological Office are available free from the same addresses. These leaflets and brochures also indicate the range of complex analyses that the Meteorological Office can undertake.

Forecasting services

For the day-to-day planning of outdoor work, special weather forecasts and warnings can be arranged to cover specific weather elements at agreed sites. Details may be obtained from:

The Director-General
Meteorological Office (Met O 7)
London Road
Bracknell
Berkshire RG12 2SZ

or from your local weather centre.

WEATHER CENTRES AND PUBLIC SERVICE OFFICES

Weather Centres

Aberdeen
Seaforth Centre
Lime Street
Aberdeen AB2 1BJ

Aberdeen (0224) 210571

Bristol
The Gaunts House
Denmark Street
Bristol BS1 5DH

Bristol (0272) 279272

Cardiff
Southgate House
Wood Street
Cardiff CF1 1EW

Cardiff (0222) 390420

Glasgow
33 Bothwell Street
Glasgow G2 6TS

041—248 7272

Leeds
Oak House
Park Lane
Leeds LS3 1EL

Leeds (0532) 457753

London
284–286 High Holborn
London WC1V 7HX

01—430 5627

Manchester
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Exchange Street
Stockport SK3 0ER

061—477 1017

Newcastle
7th Floor
Newgate House
Newgate Street
Newcastle-upon-Tyne NE1 5UQ

091—232 3808

Norwich
Rouen House
Rouen Road
Norwich NR1 1RB

Norwich (0603) 630164

Nottingham
Main Road
Watnall
Nottingham NG16 1HT

Nottingham (0602) 384094

Plymouth
Royal Air Force Mount Batten
Plymouth
Devon PL9 9SH

Plymouth (0752) 493377

Southampton
160 High Street-below-bar
Southampton SO1 0BT

Southampton (0703) 220646

Public Service Offices

Meteorological offices at:

Belfast International Airport
Belfast
Northern Ireland BT29 4AB

Crumlin (084 94) 22804

Birmingham Airport
Birmingham B26 3QN

021—782 6240

Kirkwall Airport
Kirkwall
Orkney KW15 1TH

Kirkwall (0856) 3802

Sella Ness
Port Admin Area
Craven, Mossbank
Shetland ZE2 9QR

Sullom Voe (0806) 242060

THE CLIMATE OF GREAT BRITAIN

This memorandum is one of a series which will cover the whole of Great Britain in due course, published in the Climatological Memoranda range. The Introduction (CM 113) to the series explains how various weather elements are measured. The areas to be covered are:

SCOTLAND

114 Borders Region
115 Edinburgh, Lothian Region and Stirling
116 Fife, Dundee and Perth
117 Aberdeen and Buchan
118 Moray Firth coastal Region
119 Northern Isles
120 Western Isles
121 Skye and the North-west
122 Argyll and the Inner Hebrides
123 The Grampians and Perthshire Highlands
124 Glasgow and the Clyde valley
125 Ayrshire and the Firth of Clyde
126 Dumfries and Galloway Region

ENGLAND

127 North-east England
128 Pennines and Lake District
129 East Yorkshire and North Humberside
130 Lancashire and Cheshire and Isle of Man
131 Trent Valley
132 Midlands
133 East Anglia and Lincolnshire
134 Thames Valley
135 London
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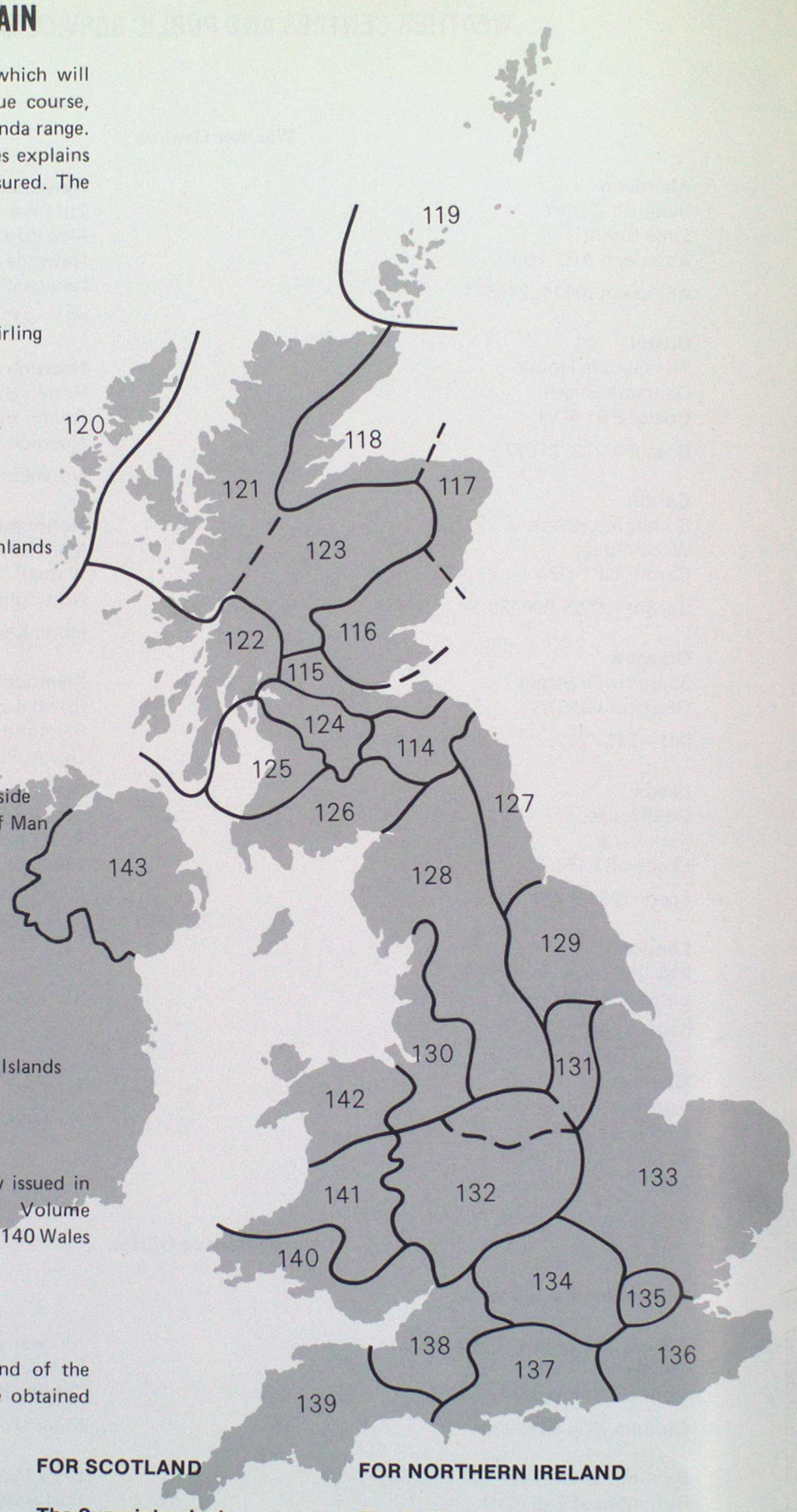

Further details of these memoranda and of the services mentioned on page 16 can be obtained from:

FOR ENGLAND AND WALES

Advisory Services
Meteorological Office (Met O 3b)
London Road
Bracknell
Berkshire RG12 2SZ

FOR SCOTLAND

The Superintendent
Meteorological Office
Saughton House
Broomhouse Drive
Edinburgh EH11 3XQ

FOR NORTHERN IRELAND

The Senior Meteorological Officer
Belfast Weather Centre
1 College Square East
Belfast BT1 6BQ

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