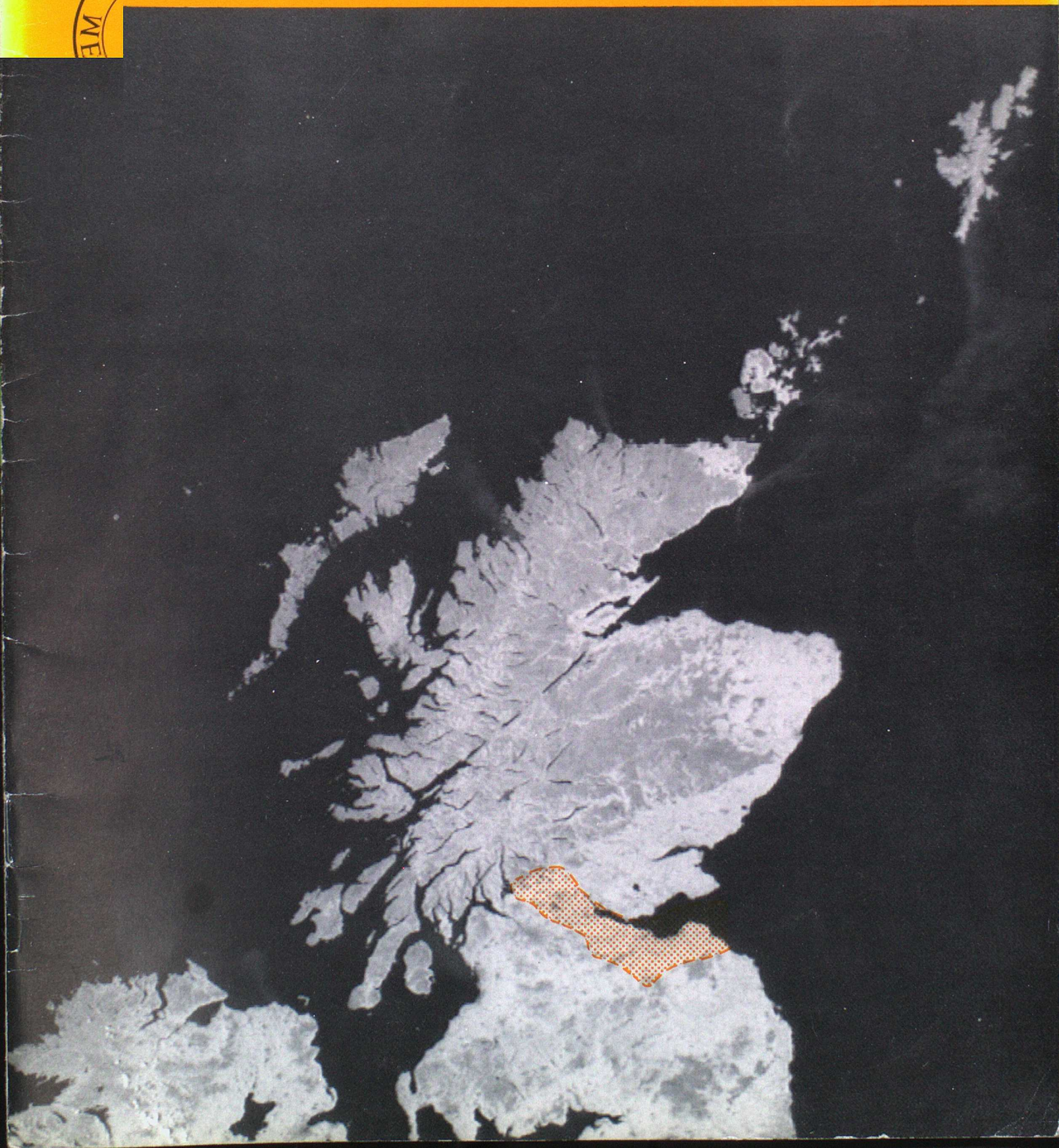
THE CLIMATE OF GREAT BRITAIN

EDINBURGH, THE LOTHIAN REGION AND STIRLING

Climatological Memorandum 115



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The front cover shows a view of Scotland from the satellite Tiros N, taken at 1518 GMT on Saturday 17 May 1980 – photograph by courtesy of the Department of Electrical Engineering and Electronics, University of Dundee.

An anticyclone was drifting slowly northwards across the Norwegian Sea, but a ridge of high pressure was still being maintained over Scotland. Most places in the Lothian and Central Regions had around 14 hours of sunshine, with Dunbar recording as high as 14.8 hours although a sea-breeze kept the maximum temperature down to 13 °C. In and around Edinburgh the maximum temperatures ranged from 17 to 20 °C, and in Stirling reached 23 °C.

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Edinburgh, the Lothian Region and Stirling

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.

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 these needs are given on page 17.

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Meteorological Office, Edinburgh

September 1982

THE AREA

This memorandum describes the main features of the climate of the Lothian Region, including Edinburgh, and the lowland part of the Central Region. The area, some 130 kilometres long and between 20 and 30 kilometres wide, stretches from Dunbar and the North Sea coast in the east, through Edinburgh, Falkirk and Stirling, to the shores of Loch Lomond in the west. The map below shows the main topographical features of the area along with the main centres of population. Weather-recording stations whose data have been used in this memorandum are also shown.

Haddington, 27 kilometres east of Edinburgh, is at the centre of the fertile farming area of East Lothian. To the north of Haddington the small villages of Aberlady and North Berwick lie on the sandy shores of the Firth of Forth. To the south the land rises gradually to the moorland expanses of the Moorfoot and Lammermuir Hills with altitudes of between 400 and 500 metres.

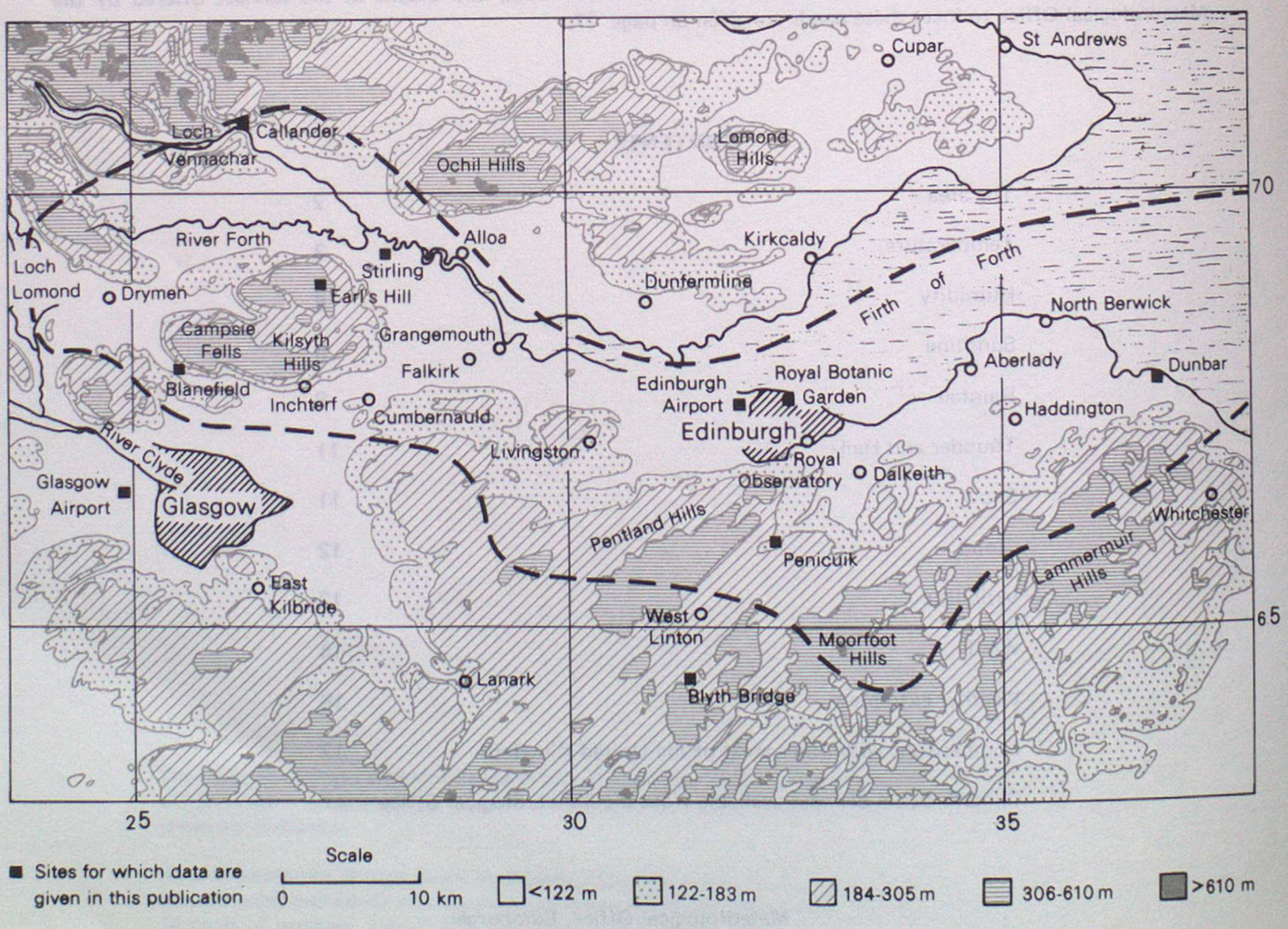
The city of Edinburgh occupies a roughly central position in the area described in this memorandum. The north-eastern shoulders of the Pentland Hills (about 500 metres) encroach on the city boundaries, making Edinburgh one of the most topographically and climatically complex cities in the United Kingdom.

South of the city boundary the ground continues its steady rise until open moorland is reached beyond Penicuik. Although the towns of Dalkeith, Lasswade, Loanhead and Penicuik in the valley of the River Esk still retain an industrial base, the decline of the coal-mining and paper-making industries has resulted in an increasing proportion of their inhabitants commuting daily to Edinburgh.

Between Edinburgh and Stirling the low-lying coastal area contains a mixture of agriculture and industry with the relatively modern industrial complex at Grangemouth standing alongside the older-established centres at Falkirk and along the Carron Valley. The new towns at Livingston and Cumbernauld provide further evidence of the developments of the last two decades, in contrast to the residues of shale- and coal-working from earlier days.

At Stirling the River Forth passes between the Ochil Hills to the north-east with several peaks above 600 metres, and the peaks of the Gargunnock (485 metres) and Fintry (482 metres) Hills and the Campsie Fells (578 metres) to the south-west. To the west of Stirling the River Forth meanders through the flat lands of Flanders Moss. The north-west boundary of the area is marked by the town of Callander where the ground begins its rise to the southern flank of the Perthshire mountains. The valley of the Endrick Water runs westward from the Campsie Fells towards the small town of Drymen and Loch Lomondside.

Topographical map of the area. Co-ordinates are National Grid references.



TEMPERATURE

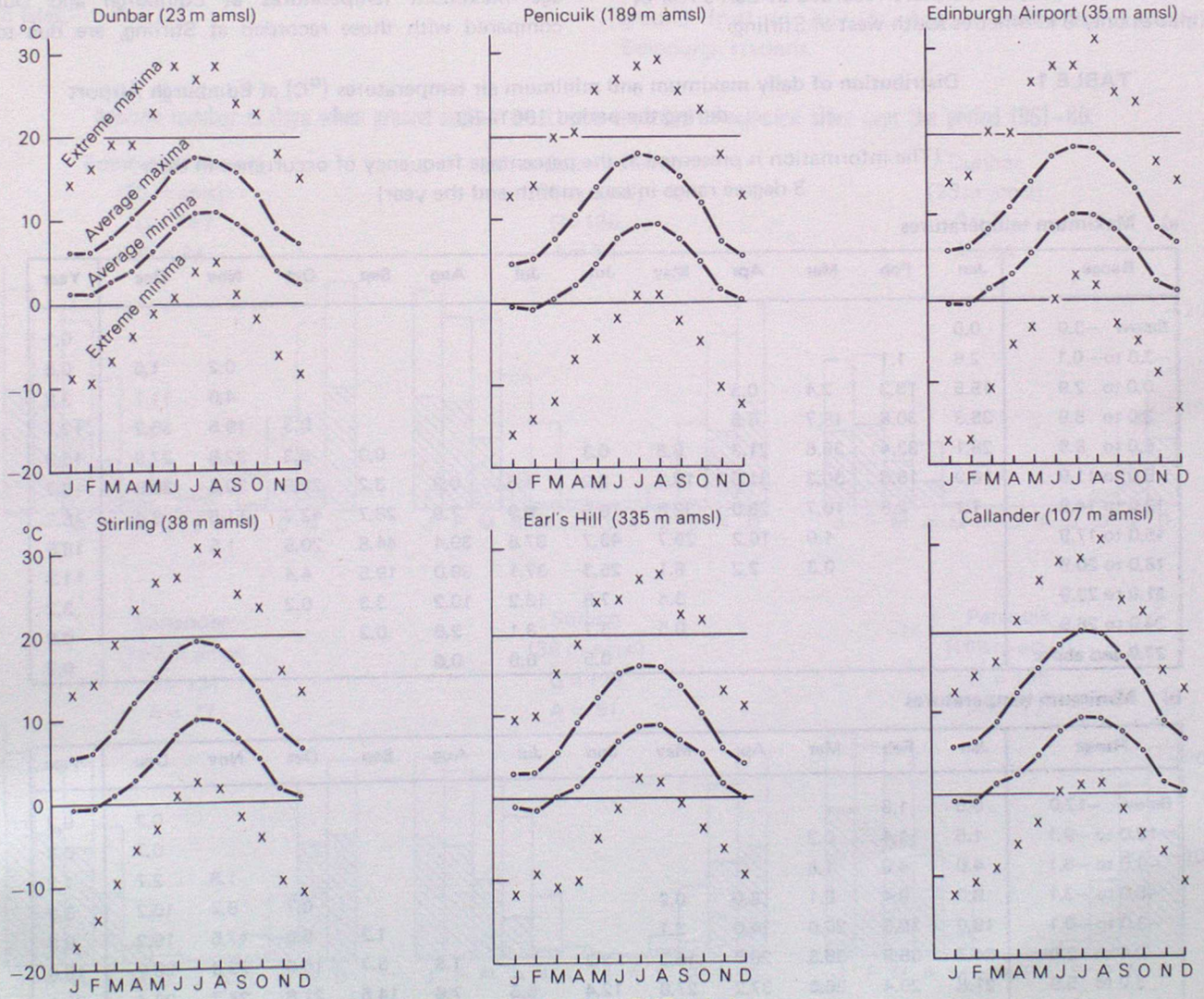
Air temperature varies widely both in space and time. Temporal variations range from the regular rhythm of seasonal and diurnal changes to the less regular fluctuations caused by the passage of weather systems. Spatial variations in an area such as the one covered by this memorandum are also significant and are mainly caused by differences in altitude and distance from the sea. In the eastern half of the area the altitude varies between sea level and 650 metres, whilst in the west the variation is somewhat less. The Firth of Forth is the main body of open water and its effects, along with those of the North Sea and to a lesser extent the seas to the west of the country, are felt throughout the area.

Temperature data can be summarized in many different ways, depending on the requirements of the user. For example, the number of days or hours with temperatures above or below certain limits, the percentage frequency of occurrence of a specified range of temperatures, and the duration of spells of high or low temperatures can all be provided. However, the simplest and most familiar to the majority of people is a statement of the average and extreme values recorded. The diagrams below give, for a selection of places, the absolute maximum and minimum temperatures recorded in each month during the period 1951–80 and also the average values of daily maximum and minimum over the same 30 years.

The sea is slow to gain and lose heat and its effect on air temperature can be seen by comparing data from Dunbar with, say, Stirling. Average maxima at Dunbar are higher in winter and lower in summer whilst average minima are higher throughout the year. The average daily range of temperature at Dunbar is also less.

During winter months, when temperatures are controlled more by the type of air mass than by solar heating, the highest temperatures are recorded with south-westerly winds when the air has had a long passage over relatively warm seas before reaching the British Isles. In these conditions, maximum temperatures show little variation over the region,

Average and absolute daily maximum and minimum air temperatures at selected sites month by month over the period 1951–80.



Notes:
1. Data are based on 24-hour temperature extremes read at 0900 GMT each day.
2. amsl = above mean sea level.
3. Observations started at Stirling in 1970, at Earl's Hill in 1962 and at Callander in 1966. The absolute temperatures shown were recorded between these dates and 1980, whilst the averages have been adjusted to the standard period 1951–80 by comparison with data from nearby stations.

usually lying between 12 and 14 °C. The slightly higher temperatures recorded in the east of the area are due to the heating experienced by the air on descent from the hills to windward – the föhn effect (see the Introduction to the series).

Easterly winds also have a track over the sea but the North Sea is colder than the seas to the west. However, the temperature and humidity characteristics of the easterly airstreams have already been largely determined by passage over continental Europe. In winter this land mass is very cold and it is this which is responsible for some of the lowest winter temperatures, especially under clear skies when winds are light. In these conditions topography plays an important role, since the cold dense air drains off the hills to stagnate in the valleys and hollows.

Edinburgh Airport and Stirling are both situated in relatively low-lying areas and the effect on temperatures during clear nights can be seen opposite. Both places have recorded an absolute minimum of −17 °C, around one to two degrees lower than that recorded at Penicuik at an altitude of 189 metres on the shoulders of the Pentlands and five degrees lower than the lowest temperature recorded at Earl's Hill at 335 metres only 9 kilometres south-west of Stirling.

This drainage of cold air is also an important feature of the climate of the City of Edinburgh. The weather-recording site at the Royal Botanic Garden is typical of much of the lower-lying parts of the city and, although the site is not in a pronounced frost hollow, absolute minima recorded on cold clear nights in winter are significantly lower than those experienced in the higher southern parts of the city. For example, air temperatures at the Royal Observatory at Blackford Hill (134 metres), 5 kilometres to the south of the Royal Botanic Garden), never fell below −10 °C during the period 1951–80, whereas values of around −15 °C were recorded at the Botanic Garden.

In summer, although the air mass is still of importance, other influences on temperature such as solar heating, altitude and, particularly in the eastern half of the region, wind direction have a considerable modifying effect. Although no data are available from the highest parts of the area, altitude alone can be sufficient to produce a temperature decrease of 5 °C on the hottest, and 2 °C on an average, summer's day. In coastal areas an easterly wind is of great importance, whether produced by a large-scale weather system or by a sea-breeze (see the Introduction to the series). The lower summer average maximum temperatures at Edinburgh and Dunbar, compared with those recorded at Stirling, are due to the

TABLE 1 Distribution of daily maximum and minimum air temperatures (°C) at Edinburgh Airport during the period 1961–80

(The information is presented as the percentage frequency of occurrence in each 3 degree range in each month and the year)

a) Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Below −3.0	0.5										0.2	1.6	0.1
−3.0 to −0.1	2.6	1.1									4.0	11.1	0.5
0.0 to 2.9	15.5	13.3	2.4	0.3						0.3	19.5	35.2	3.8
3.0 to 5.9	35.3	30.8	18.7	6.5					0.3	5.3	32.8	27.9	12.1
6.0 to 8.9	28.1	33.4	36.6	21.3	5.8	0.3			3.2	26.6	30.5	20.8	15.9
9.0 to 11.9	16.9	18.6	30.3	31.5	18.7	2.2	1.5	0.3	28.7	42.7	11.5	3.4	16.7
12.0 to 14.9	1.1	2.8	10.7	28.0	39.8	16.5	6.9	7.9	44.8	20.5	1.5		16.7
15.0 to 17.9			1.0	10.2	25.7	43.7	37.6	39.4	19.5	4.4			18.8
18.0 to 20.9			0.3	2.2	6.1	25.3	37.1	39.0	3.3	0.2			11.2
21.0 to 23.9					3.4	7.8	13.2	10.2	0.2				3.2
24.0 to 26.9					0.5	3.7	3.1	2.6					0.8
27.0 and above						0.5	0.6	0.6					0.2

b) Minimum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Below −12.0	0.5	1.8										0.3	0.2
−12.0 to −9.1	1.5	1.4	0.2									0.7	0.3
−9.0 to −6.1	4.0	4.8	1.6								1.8	2.7	1.2
−6.0 to −3.1	9.0	9.4	6.1	3.0	0.2					0.7	8.2	10.2	3.9
−3.0 to −0.1	19.0	19.3	20.0	14.0	3.1				1.2	5.5	17.5	19.2	9.8
0.0 to 2.9	34.7	35.9	36.3	26.0	16.3	2.3		1.8	3.7	15.0	23.3	28.2	18.6
3.0 to 5.9	21.8	20.4	26.0	37.2	27.6	12.4	5.5	7.6	14.5	21.8	24.7	22.4	20.1
6.0 to 8.9	7.4	6.5	8.7	15.8	41.1	33.2	24.2	22.4	28.8	27.7	16.8	13.1	20.6
9.0 to 11.9	2.1	0.5	1.1	4.0	11.4	44.0	43.7	40.9	36.0	23.7	7.0	3.2	18.2
12.0 to 14.9					0.3	7.8	24.5	24.7	15.0	5.3	0.7		6.6
15.0 and above						0.3	2.1	2.6	0.8	0.3			0.5

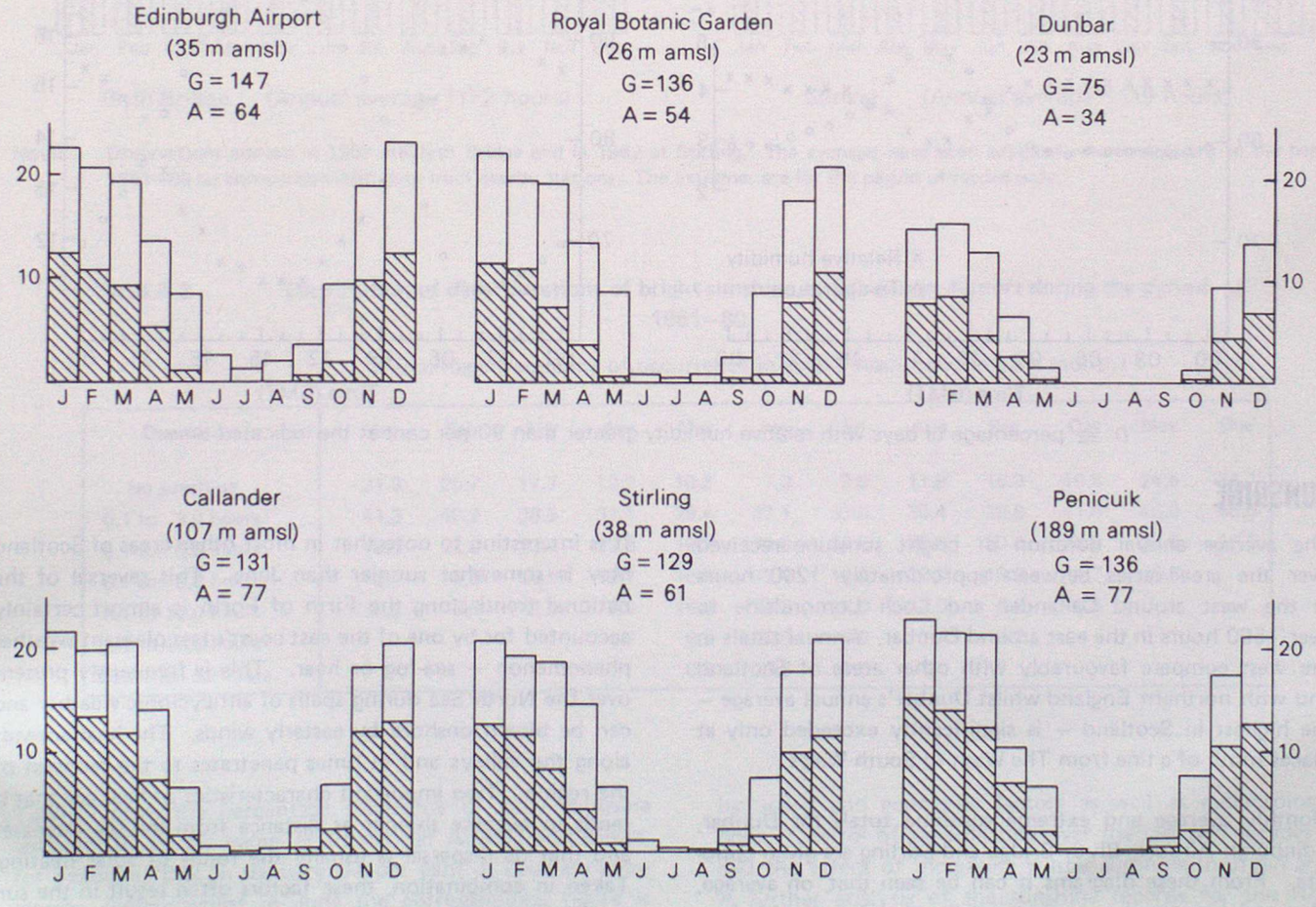
effects of such winds. The greatest difference – in May and June – comes at a time when anticyclonic conditions over Scandinavia often produce dry sunny weather over much of Scotland. The accompanying easterly winds, blowing over the cold waters of the North Sea and probably reinforced by sea-breezes, considerably reduce the temperatures along the coastal strip.

To give some idea of the distribution of daily maximum and minimum temperatures about the average, a more detailed analysis of the data for Edinburgh Airport is given in Table 1. This shows the percentage frequency of both maximum and minimum temperatures in 3 °C bands for each month. It can be seen that, for example, on 4.0 per cent of days in the 20 Januarys between 1961 and 1980 the minimum temperature was within the range –6.1 to –9.0 °C whilst on only 0.5 per cent of the days was it below –12 °C. (A frequency of one day per month is equivalent to approximately 3 per cent). The sharp cut-off of maximum temperature at 12 °C in December, January, and February is particularly noticeable and emphasizes the point made earlier that the upper limit to maximum temperatures in winter is effectively controlled by the sea surface temperatures to the south-west of the British Isles.

The diurnal variation of temperature in the summer is determined primarily by direct heating from the sun, and so average values of temperature for each hour of the day in July at Edinburgh (see the diagram on page 6) show a sharp rise after dawn to a maximum at around 1400 or 1500 hours, followed by a smooth fall through the evening and night as radiative cooling occurs. In January the values have a much smaller range since the solar radiation reaching the ground in winter is much less and the extremes of temperature during the 24 hours, particularly the minimum, are much more dependent on critical changes of air mass, cloud cover, or wind speed, which can occur at any time.

Many outdoor activities are affected by prevailing temperatures and probably the most critical threshold is 0 °C. The diagram below shows the monthly distribution of the number of days of air frost and ground frost (see the Introduction to the series for definitions) at six places. As the diagram shows, ground frost can occur at any time of the year, although in summer it is uncommon, being confined to inland sites – especially frost hollows such as Edinburgh Airport. It is interesting to note that Edinburgh Royal Observatory on Blackford Hill has never experienced a ground frost in July or August, unlike the lower-lying Edinburgh stations.

Average number of days when ground and air frost were recorded at selected sites over the period 1961–80.



Notes:
1. Whole columns show ground frost; hatching denotes air frost.
2. G and A = annual average number of days with ground (G) and air (A) frost.
3. Although at Edinburgh Airport a day of air frost is normally defined for the period 2100–2100 GMT and ground frost measured over the period 2100–0900 GMT, in this instance the data have been adjusted to conform to the standard of 0900–0900 GMT in use at the other stations.

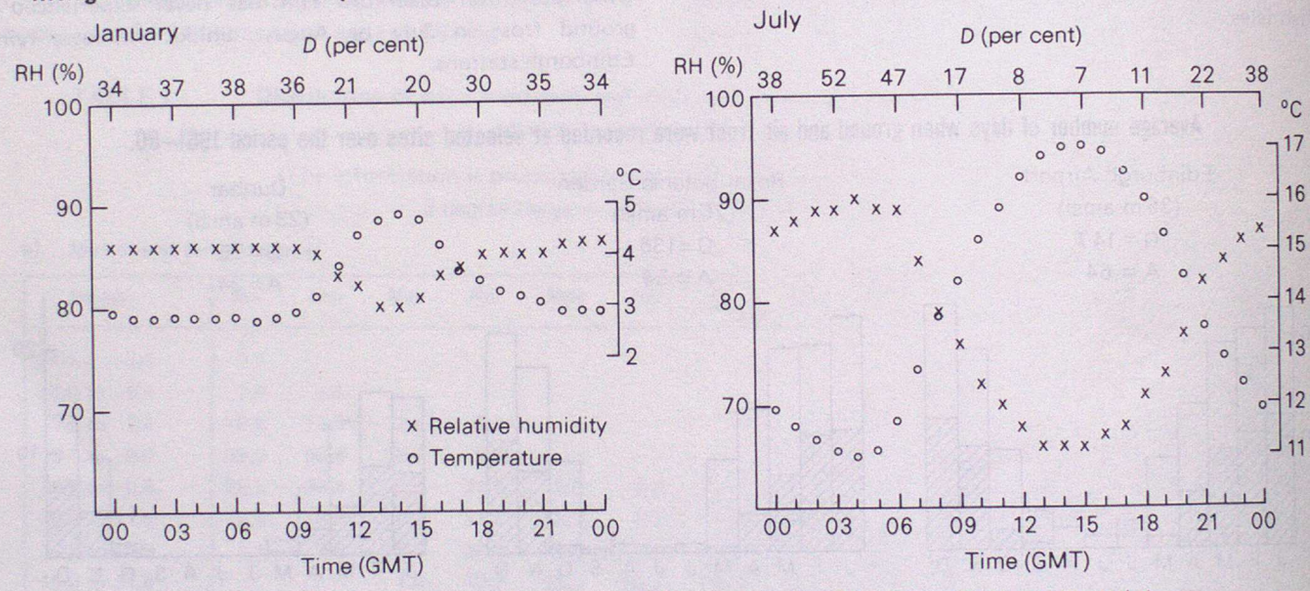
HUMIDITY

The relative humidity of an air sample is the ratio (expressed as a percentage) of the actual water vapour pressure to the maximum (saturation) vapour pressure which could be sustained at the given air temperature. The maximum value increases significantly with increasing temperature, and so the relative humidity displays a substantial diurnal variation as the temperature varies. The diagram below shows the change in relative humidity (RH) with time of day in January and July at Edinburgh Airport along with the corresponding variation of average temperature over the period 1961 to 1980. When the temperature reaches its maximum value during the afternoon, the relative humidity reaches a minimum, and vice versa. Since the average daily range of temperature in winter is much less than in summer, the variation of average relative humidity throughout the day is also less.

The variability of relative humidity from day to day is large, and values can reach 100 per cent (i.e. saturation) at any time of the day during fog or rain. The figures entered along the top of the diagram give, at three-hourly intervals, the percentage of occasions in the period 1961 to 1980 when the relative humidity exceeded 90 per cent. For example, on only 7 per cent of days in July is the relative humidity above 90 per cent at 1500 GMT, whereas in January 20 per cent of days are above 90 per cent at this time. During the early hours of the morning, the relative humidity exceeds 90 per cent on about 35 per cent of days in winter and about 50 per cent of days in summer.

Variations in humidity from place to place are small compared with the large changes which can occur over short periods of time, so the data presented for Edinburgh can be considered as representative of much of the lower ground in the area.

Average diurnal variation of temperature and relative humidity at Edinburgh Airport for January and July over the period 1961–80.



$D \equiv$ percentage of days with relative humidity greater than 90 per cent at the indicated time

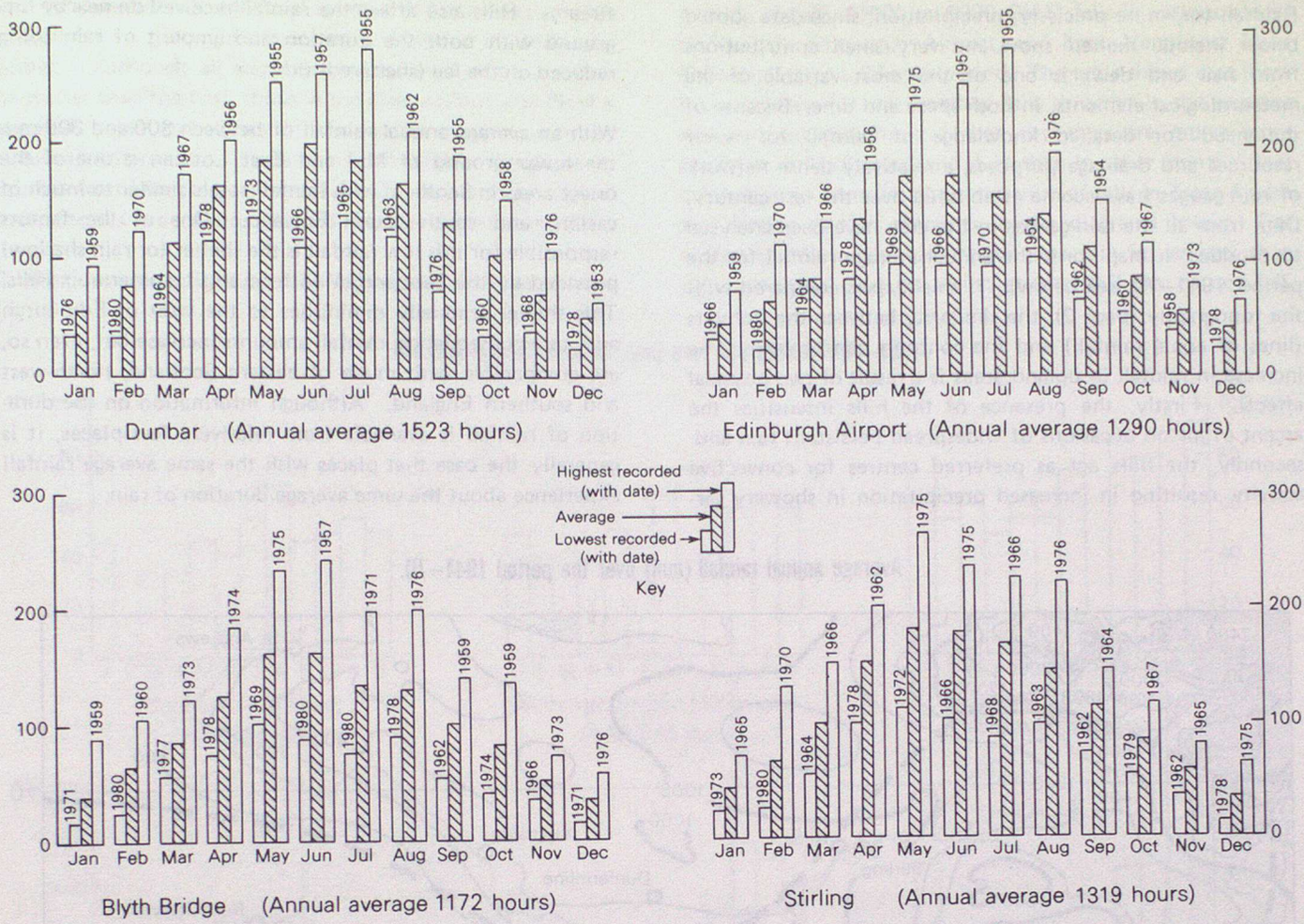
SUNSHINE

The average annual duration of bright sunshine received over the area varies between approximately 1200 hours in the west around Callander and Loch Lomondside to over 1500 hours in the east around Dunbar. Annual totals in the west compare favourably with other areas of Scotland and with northern England whilst Dunbar's annual average – the highest in Scotland – is significantly exceeded only at places south of a line from The Wash to South Wales.

Monthly average and extreme sunshine totals for Dunbar, Edinburgh Airport, Blyth Bridge and Stirling are given opposite. From these diagrams it can be seen that, on average, May and June are the sunniest months of the year, with June marginally sunnier in the eastern part of the area. This is because of the high incidence of anticyclonic conditions during these months and is a feature of the weather over Scotland as a whole.

It is interesting to note that in most other areas of Scotland May is somewhat sunnier than June. This reversal of the national trend along the Firth of Forth is almost certainly accounted for by one of the east coast's less pleasant weather phenomenon – sea-fog or haar. This is frequently present over the North Sea during spells of anticyclonic weather and can be blown onshore by easterly winds. The haar spreads along the valleys and at times penetrates to the far west of the region. Two important characteristics of haar are that it tends to become thinner as distance from the sea increases and that its dispersal is usually the result of solar heating. Taken in combination, these factors often result in the sun breaking through earlier inland than along the coast and earlier in June than in May owing to the increased solar heating.

Average and extreme monthly totals of duration of bright sunshine (in hours) at selected sites.



Dunbar (Annual average 1523 hours)

Edinburgh Airport (Annual average 1290 hours)

Blyth Bridge (Annual average 1172 hours)

Stirling (Annual average 1319 hours)

Note: Observations started in 1957 at Blyth Bridge and in 1962 at Stirling. The averages have been adjusted where necessary to the period 1951–80 by comparison with data from nearby stations. The extremes are for the period of record only.

TABLE 2 **Distribution of daily durations of bright sunshine at Edinburgh Airport during the period 1961–80**

(Percentage frequency of occurrence in each 3-hour band in each month)

Duration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No sunshine	37.3	25.7	17.7	12.7	10.3	7.3	9.0	11.9	15.0	19.5	24.5	34.7
0.1 to 3.0 hours	41.3	40.2	38.5	31.1	29.4	27.1	33.0	30.4	38.8	41.4	46.0	46.6
3.1 to 6.0 hours	18.5	22.8	22.4	22.8	19.7	22.0	20.8	20.6	20.0	23.9	23.0	18.7
6.1 to 9.0 hours	2.7	10.8	18.5	19.7	16.9	19.0	16.9	20.5	19.2	14.7	6.5	
9.1 to 12.0 hours	0.2	0.5	2.9	12.0	15.0	13.8	12.9	12.9	6.8	0.5		
12.1 to 15.0 hours				1.7	8.5	10.0	6.9	3.7	0.2			
More than 15 hours					0.2	0.8	0.5					

Table 2 gives the percentage frequency of daily sunshine amounts in 3-hour bands at Edinburgh Airport and shows, for example, that in January 37 per cent of days are completely sunless whilst in June the corresponding figure is 7 per cent. (To the nearest whole day these figures are equivalent to 11 and 2 days, respectively, in the month.)

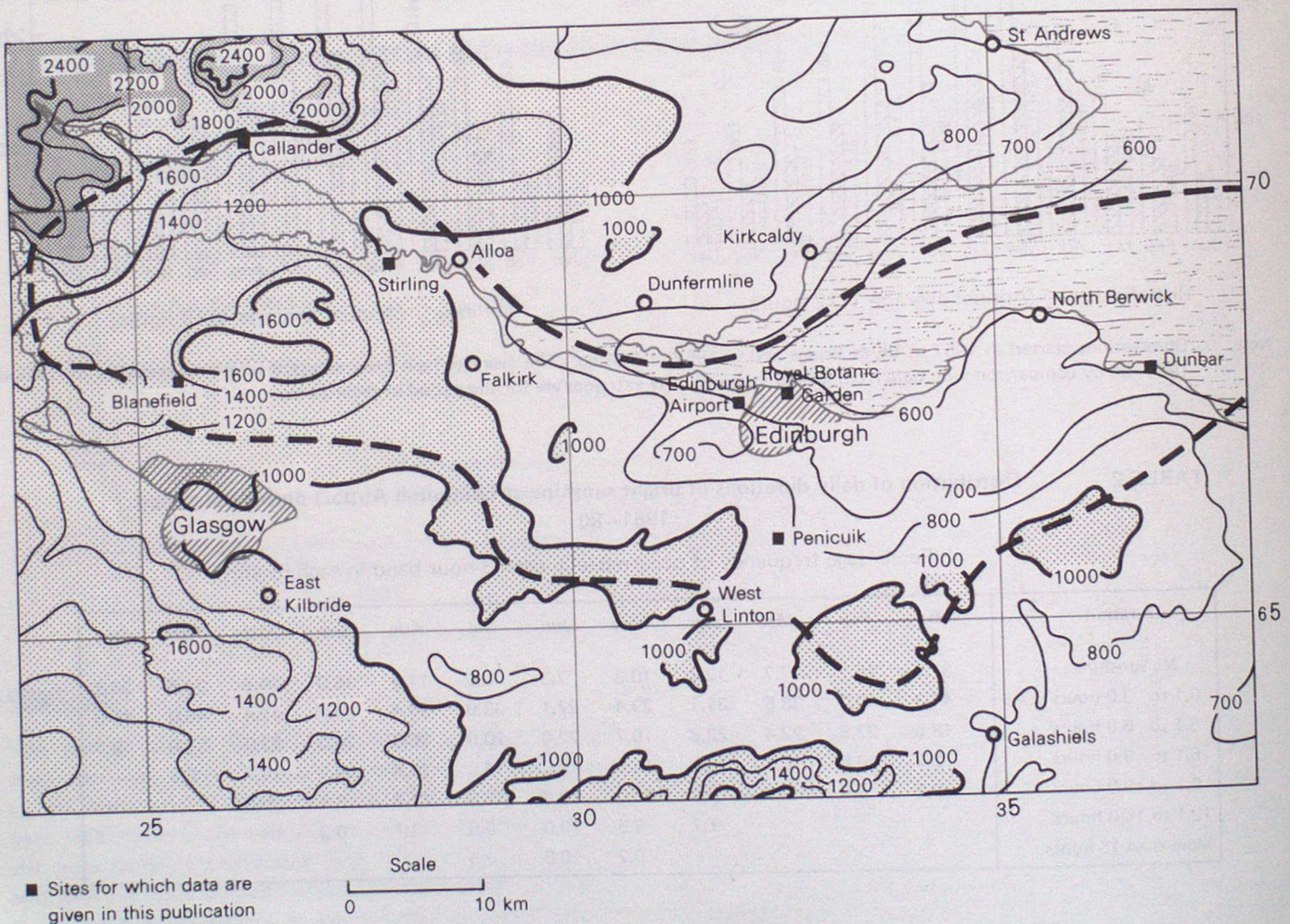
Sunshine is one of the few weather elements to be affected by social and economic factors as well as meteorological ones. Control of air pollution over the last two decades has had the effect of increasing winter sunshine in urban areas. A further analysis of the sunshine records for the Royal Observatory and the Royal Botanic Garden, both in Edinburgh, shows evidence of this, with the sunshine totals at the Botanic Garden increasing relative to the Observatory since the early 1960s.

RAINFALL

Rainfall (or, more precisely, precipitation, since data quoted below include melted snow and very small contributions from hail and dew) is one of the most variable of the meteorological elements, in both space and time. Because of the need for detailed knowledge of rainfall for water resources and drainage purposes, a relatively dense network of rain-gauges has become established over the last century. Data from all the rain-gauges in the area have been analysed to produce in map form the annual average rainfall for the period 1941–70 (see below). If this map is compared with the topography (page 2), the similarity between the isohyets (lines of equal rainfall) and the contours can be seen. The increase in rainfall in upland areas is a result of two physical effects. Firstly, the presence of the hills intensifies the ascent of air on occasions of widespread persistent rain and secondly, the hills act as preferred centres for convective activity resulting in increased precipitation in showery air-streams. Hills also affect the rainfall received on nearby low ground with both the duration and amount of rain being reduced on the lee (sheltered) side.

With an average annual rainfall of between 600 and 800 mm the lower ground of Mid and East Lothian is one of the driest areas in Scotland with rainfall totals similar to much of eastern and south-eastern England. One of the factors responsible for this low rainfall is the shelter (or rain shadow) provided by the Pentland, Moorfoot and Lammermuir Hills. This shelter gradually diminishes to the west of Edinburgh and, as a consequence, rainfall amounts increase but, even so, are comparable with much of eastern Scotland, north-west and southern England. Although information on the duration of rainfall is available from relatively few places, it is generally the case that places with the same average rainfall experience about the same average duration of rain.

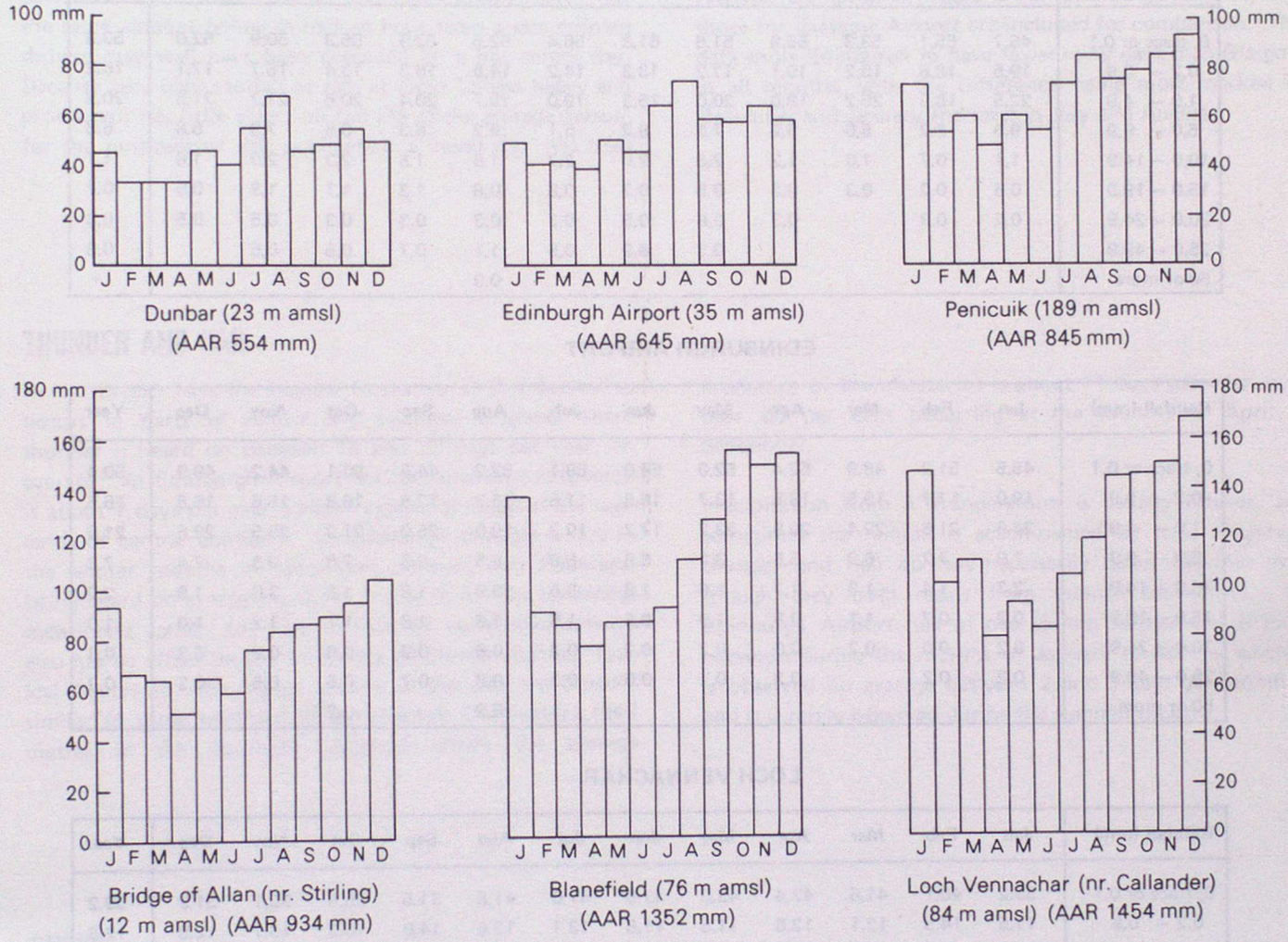
Average annual rainfall (mm) over the period 1941–70.



The contribution of individual months to the average annual rainfall for six places in the region is shown in the diagrams below. Although all show the second half of the year to be wetter than the first, those in the drier eastern area show a summer peak and those in the wetter western area an autumn/winter one. There are considerable variations in rainfall from year to year, and Table 3 shows the highest and lowest totals in each month at Edinburgh Airport since 1951.

Turning now to individual daily falls, Table 4 shows the frequency of daily (0900 to 0900 GMT) falls in various ranges at Dunbar, Edinburgh Airport, and Loch Vennachar (near Callander) over a 20-year period. The table shows that there is a tendency for the heaviest falls to occur in the summer and autumn months and that dry days are rather more common in April, June and July than in other months. It is interesting to compare the frequency of falls in Table 4 with the average rainfall amounts in the diagrams below. For example, Edinburgh Airport has less rain in January than July but more days on which at least 0.2 mm of rain fell.

Average monthly rainfall (mm) over the period 1951–80.



amsl = above mean sea level AAR = annual average rainfall

TABLE 3 Extreme monthly and annual rainfall (mm) recorded at Edinburgh Airport between 1951 and 1980

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Wettest:													
Amount (mm)	88	105	94	62	125	118	148	147	127	165	195	113	879
Year	1957	1977	1979	1961	1968	1966	1958	1966	1965	1954	1963	1978	1954
Driest:													
Amount (mm)	9	9	12	6	14	12	16	10	6	12	16	8	438
Year	1953	1965	1953	1980	1980	1962/79	1964	1959	1972	1951	1956	1975	1972

TABLE 4 **Distribution of rainfall amounts in the rainfall day (0900 to 0900 GMT) during the period 1961–80 at Dunbar, Edinburgh Airport and Loch Vennachar**

(Percentage frequency of occurrence in each rainfall range in each month and the year)

DUNBAR

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0, trace or 0.1	46.7	55.1	53.3	55.9	51.8	61.8	56.4	52.5	52.9	55.3	50.9	52.0	53.8
0.2 – 0.9	19.5	18.6	15.2	19.1	17.2	13.3	14.2	14.5	16.3	13.4	15.7	17.1	16.2
1.0 – 4.9	22.5	18.9	25.2	18.0	20.0	15.3	19.0	19.7	20.4	20.6	21.3	21.5	20.2
5.0 – 9.9	9.5	6.2	5.0	5.2	7.3	6.2	6.1	9.2	6.3	6.5	7.3	6.8	6.8
10.0 – 14.9	1.1	0.7	1.0	1.2	2.3	2.0	2.7	1.8	1.8	2.3	2.0	1.6	1.7
15.0 – 19.9	0.5	0.2	0.3	0.3	0.5	0.7	0.8	0.6	1.3	1.1	1.8	0.5	0.7
20.0 – 24.9	0.2	0.3		0.3	0.6	0.5	0.3	0.3	0.3	0.3	0.5	0.5	0.3
25.0 – 49.9					0.3	0.2	0.5	1.1	0.7	0.5	0.5		0.3
50 or more								0.3					+

EDINBURGH AIRPORT

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0, trace or 0.1	45.5	51.2	48.9	52.4	52.0	56.0	58.1	52.2	44.5	50.1	44.2	49.9	50.4
0.2 – 0.9	19.0	17.7	19.5	18.5	13.7	15.8	11.5	15.2	17.5	16.8	15.5	16.8	16.5
1.0 – 4.9	24.6	21.6	22.4	20.8	23.2	17.7	19.3	19.0	25.0	21.3	25.5	22.6	21.9
5.0 – 9.9	7.9	7.2	6.9	5.5	8.1	6.5	5.6	6.5	8.5	7.6	9.3	7.4	7.3
10.0 – 14.9	2.3	1.4	1.0	1.7	1.6	2.8	3.5	3.9	1.8	1.8	3.0	1.8	2.2
15.0 – 19.9	0.2	0.7	1.1	0.8	1.0	0.5	1.5	1.6	1.8	1.1	1.2	1.0	1.0
20.0 – 24.9	0.2	0.0	0.2	0.0	0.2	0.2	0.2	0.6	0.2	0.6	0.8	0.3	0.3
25.0 – 49.9	0.2	0.2		0.3	0.2	0.5	0.3	0.8	0.7	0.5	0.5	0.2	0.3
50 or more								0.2		0.2			+

LOCH VENNACHAR

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0, trace or 0.1	33.2	40.1	41.6	47.4	43.0	47.0	47.0	41.8	31.5	35.5	32.1	31.9	39.2
0.2 – 0.9	11.5	14.5	12.1	12.8	11.5	11.8	13.1	12.6	14.0	10.3	10.7	12.8	12.3
1.0 – 4.9	21.1	20.7	20.5	22.8	22.4	22.3	21.0	20.8	20.8	23.7	23.2	23.2	21.9
5.0 – 9.9	15.8	10.6	11.6	9.3	12.6	9.8	9.3	12.1	13.5	12.9	13.0	13.2	12.0
10.0 – 14.9	8.2	7.6	6.5	4.0	5.3	5.3	2.9	6.1	8.7	6.9	10.0	8.6	6.7
15.0 – 19.9	5.6	3.3	4.3	1.3	3.4	2.1	3.4	2.1	5.8	5.3	4.2	5.7	3.9
20.0 – 24.9	2.3	1.3	2.1	1.5	1.3	1.2	1.5	1.9	2.5	2.4	3.3	2.7	2.0
25.0 – 49.9	2.3	1.9	1.1	0.7	0.5	0.3	1.8	2.6	3.2	2.7	3.5	1.9	1.9
50 or more	0.2		0.2	0.2		0.2				0.3			0.1

+ = less than 0.05 per cent

TABLE 5 **Average number of 'rainy days' at Edinburgh and Glasgow Airports over the period 1961–80 (i.e. days with accumulated rainfall duration of at least 2 hours, ignoring hours with less than 0.2 mm of rain, within the period 0700–1700 GMT)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Edinburgh Airport	3.2	2.8	2.7	2.5	2.8	1.5	2.9	3.5	2.9	3.3	3.5	2.9	34.7
Glasgow Airport	6.9	4.1	4.7	3.1	3.7	3.3	3.3	3.9	5.3	5.3	5.9	5.8	55.2

Any definition of a rainy day is purely a subjective matter, involving a combination of rainfall amount, duration and time of day. A total of 10 mm of rain falling steadily from dawn to dusk would definitely constitute a 'rainy day', but the same amount falling in half an hour from a late evening shower may well have been preceded by a hot sunny day. Because very light rainfall or rain at night (unless heavy and prolonged) has little effect on the life of the average person, for the purposes of this publication a 'rainy day' has been defined as one with an accumulated rainfall duration of at least 2 hours within the period 0700 to 1700 GMT, excluding those hours with less than 0.2 mm. Twenty-year averages are given in Table 5 for Edinburgh Airport, and those for Glasgow Airport are included for comparison. The data show Edinburgh to have fewer rainy days than Glasgow in all months, with the difference being most marked in December and January and least in July and August.

THUNDER AND HAIL

In the British Isles the highest frequency of thunderstorms occurs in parts of central and southern England where thunder is heard on between 15 and 20 days per year, on average. At Edinburgh Airport the corresponding frequency is about 7 days per year, a figure typical of much of the lowlands of central Scotland. In Edinburgh thunder is rare in the winter months of December, January and February, being heard on average in about 1 year in 5. The tendency, mentioned earlier, for hills to increase convective activity also has an effect on the frequency of thunderstorms. Typical figures for the higher ground in the area are broadly similar to those recorded at Eskdalemuir Observatory (247 metres in the Southern Uplands) where the average frequency of thunderstorms is about 11 days per year, with over 80 per cent occurring in the months of April to September.

Precipitation from a thunderstorm is usually intense, and sometimes the rainfall is accompanied by hail. However, thunder and hail do not necessarily occur together even though they both result from intense convection. At Edinburgh Airport hail of over 5 mm in diameter is most common during the months of January to April – when it is observed on average between 2 and 3 days per month – and it is rarely observed during the summer months.

SNOW

The incidence of snow is extremely variable from year to year. During the severe winter of 1962/63, for example, there were 50 days with snow lying at the Royal Botanic Garden in Edinburgh compared with only 4 days the following winter. In any given year the most important factors governing the frequency with which precipitation falls as snow are altitude and the exposure to cold snow-bearing winds. Altitude also affects the persistence of the resultant snow cover, as does the lie of the land and nearby shelter, since snow tends to lie longer on north-facing slopes and in areas shaded from direct sunshine.

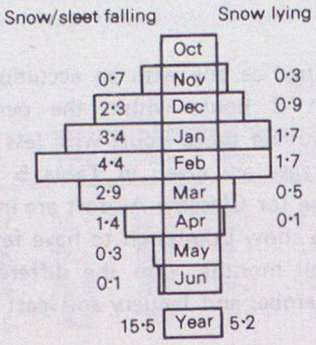
As the diagrams on page 12 show, there is a marked increase in the average number of days with snow lying between the Royal Botanic Garden (26 metres) and Penicuik (189 metres). Data from places at a higher altitude than Penicuik show a continuation of this trend with snow cover at Whitchester (255 metres) being, on average, four times more persistent than at the Royal Botanic Garden.

The eastern part of the region is very exposed to winds from the north and east. In winter-time, cold air from these directions can gain moisture by evaporation from the warmer North Sea and significant falls of snow can occur, with drifting if winds are strong. The west of the region is comparatively sheltered, but snow-bearing easterlies do penetrate to Stirling and beyond on occasion. Snowfall with westerly winds is more common here than to the east of Edinburgh.

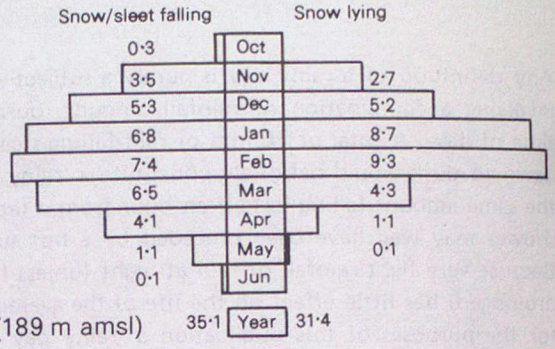
When considering the number of days with snow falling it should be noted that Edinburgh Airport is the only one of the six named places staffed by Meteorological Office personnel keeping a 24-hour watch on the weather. At all other places the observations are carried out by volunteer observers who combine this duty with their everyday jobs.

For this reason there will be occasions, especially at night, when a short-lived fall of snow will be missed by the volunteer observers and this explains the higher number of days with snow falling at Edinburgh Airport compared with the other places quoted.

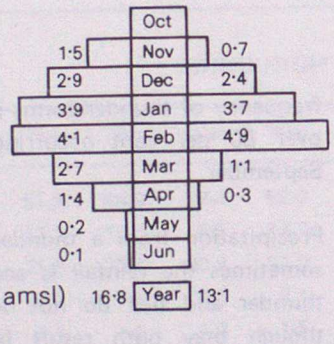
Average number of days per month with (a) snow/sleet falling, and (b) snow lying, over the period 1961–80 at selected sites.



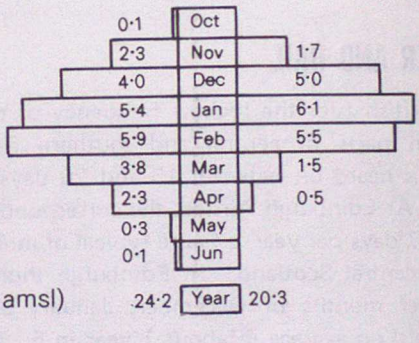
Dunbar (23 m amsl)



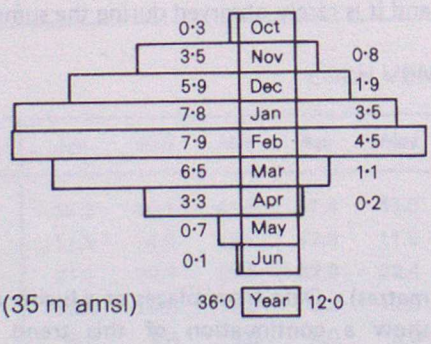
Penicuik (189 m amsl)



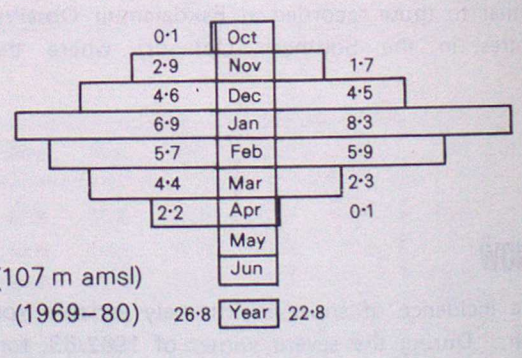
Royal Botanic Garden (26 m amsl)



Stirling (38 m amsl)



Edinburgh Airport (35 m amsl)



Callander (107 m amsl) (1969–80)

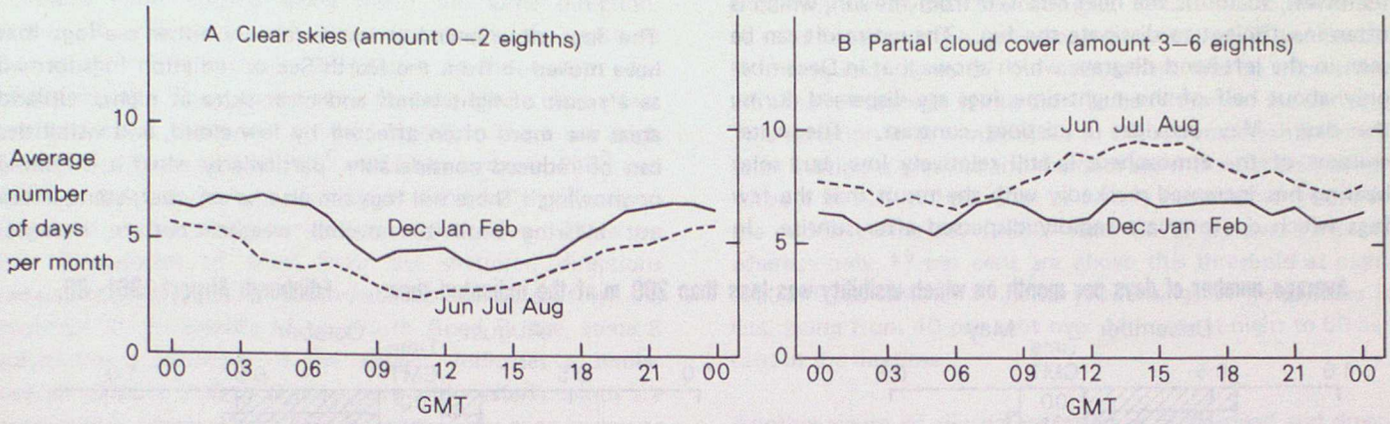
CLOUD

Cloud cover is reported as the estimated fraction of the sky (in eighths) covered by cloud at the time of observation. If cloud reports from Edinburgh Airport are separated into three ranges, 0–2, 3–6 and 7–8 eighths, then, over the year as a whole, overcast skies (i.e. cloud cover 7 and 8 eighths) occur on average for 60 per cent of the time. This percentage changes little through the year, ranging between 63 per cent in July and 50 per cent in November. For the remaining 40 per cent of the time, cloud cover occurs fairly equally in the other two ranges during the autumn and winter, with the 3–6 eighths category predominating in spring and summer.

In addition to seasonal changes, there is also a variation in cloud cover through the day. The diagrams opposite show the variation in frequency of clear skies (0–2 eighths) and of partial cloud cover (3–6 eighths) through the day at Edinburgh Airport in the winter and summer months. The incidence of clear skies is greatest and that of overcast skies is least during the hours of darkness. The frequency of partial cloud cover increases steadily from sunrise to mid-afternoon, especially in summer. This is due largely to the growth of convective (cumulus) clouds as a result of solar heating.

Information regarding cloud cover in other parts of the region is sparse but data from Glasgow Airport show a similar pattern to that at Edinburgh, so quoted figures may be taken as broadly representative of the lower ground throughout the area. Cloud cover over high ground is, in general, more extensive than in the valleys because, as mentioned earlier, hills act as preferred areas for the formation of both convective and layer clouds. In addition, descent of air in the lee of higher ground can also lead to dissipation of cloud over the lower-lying areas.

Diurnal variation of cloud cover at Edinburgh Airport (1961–80) in winter and summer.



VISIBILITY

On the whole, Scotland has always enjoyed remarkably good visibility. Smoke fogs have only been a significant factor in the immediate surroundings of major industrial centres, and even there the comparison with industrial areas of England has been favourable. Nevertheless, because of comparisons with nearby country areas, Edinburgh did earn itself the nickname 'Auld Reekie'. Therefore it is significant to note that there have been two decades of smoke-pollution control and over the same period there has been a steady improvement in visibility reported at Edinburgh Airport. The number of days with a visibility of 10 kilometres or more has increased nearly fourfold, whereas the frequency of visibilities below 400 metres has decreased by something like 30 per cent.

Occasions of poor visibility are usually of more importance to most people because of the consequent disruption to transport. In this context, and for the purposes of this memorandum, a visibility of less than 200 metres has been defined as fog. Most climatological stations in the region only record visibility once a day, at 0900 GMT. Therefore it is only possible to compare the incidence of fog at that time. Table 6 shows the average number of days of fog in each month, recorded at various places around the region. It can be seen that, over the lower ground, fogs occur most frequently during the winter months, although haar (advection fog from the North Sea) can reduce visibility to below 200 metres during spring or summer in places near the east coast.

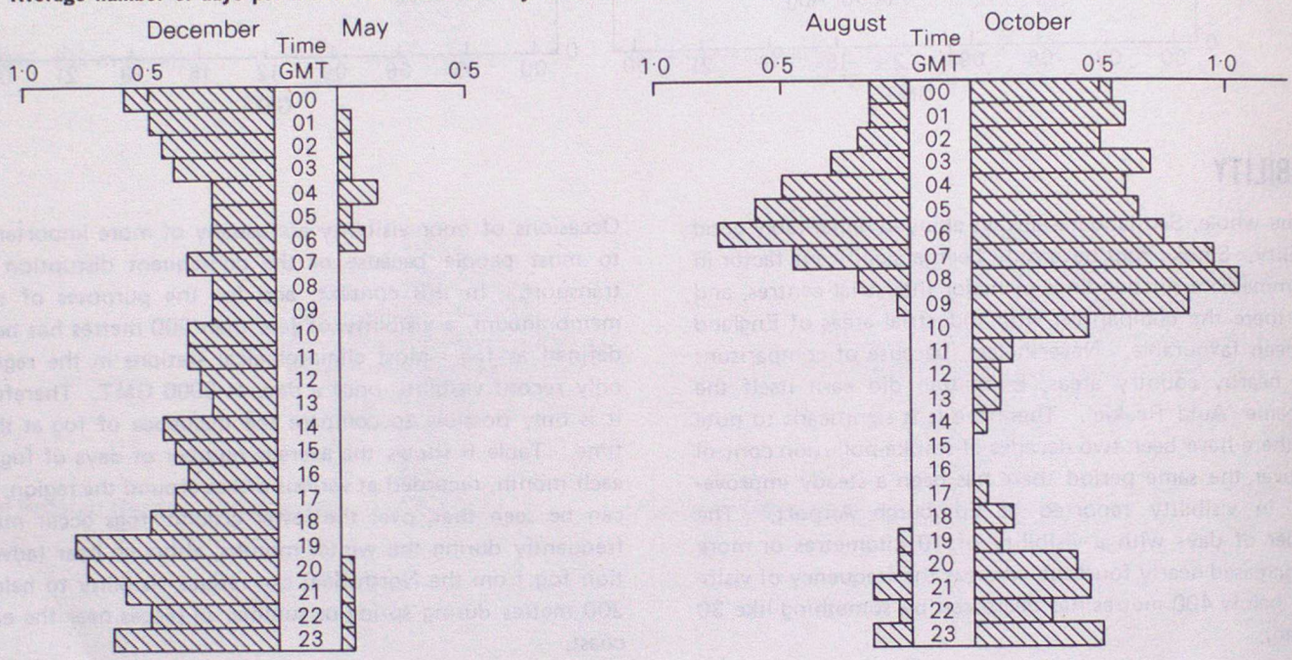
TABLE 6 Average number of days in each month and the year with visibility of less than 200 metres at 0900 GMT at selected sites over the period 1961–80

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Dunbar (1972–80) (23 m amsl)	0.1	0.2	0.2	0.5	0.4	0.0	0.4	0.7	0.1	0.3	0.0	0.0	2.9
Royal Botanic Garden (26 m amsl)	0.3	0.1	0.1	0.3	0.0	0.1	0.2	0.3	0.1	0.3	0.1	0.2	2.1
Edinburgh Airport (35 m amsl)	0.4	0.3	0.4	0.2	0.0	0.0	0.0	0.1	0.1	0.9	0.2	0.3	2.9
Penicuik (189 m amsl)	0.5	0.3	0.3	0.5	0.7	0.5	0.3	0.7	0.4	0.5	0.3	0.1	5.1
Stirling (38 m amsl)	0.3	0.2	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.3	1.8
Earl's Hill (335 m amsl)	4.1	4.4	3.5	2.4	2.9	2.2	2.3	3.0	3.1	3.9	2.8	3.4	38.0
Callander (107 m amsl)	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.5	0.1	0.3	1.5

The only place in the region at which observations of visibility are made throughout the day is Edinburgh Airport. The diagrams below illustrate the frequency of fog at hourly intervals based on these observations. Two of the key factors in the formation and dissipation of fog are the water content of the atmosphere and the amount of solar heating available. In winter, although the water content in absolute terms is at its lowest, so too is the heat received from the sun, which is often insufficient to dissipate the fog. The net result can be seen in the left-hand diagram which shows that in December only about half of the night-time fogs are dispersed during the day. May provides a distinct contrast. The water content of the atmosphere is still relatively low, but solar heating has increased markedly with the result that the few fogs which do form are rapidly dispersed after sunrise. In August, both atmospheric water content and solar radiation reaching the ground are relatively high, with the result that the frequency of night-time fogs is much higher than in May, but again rapid dispersal occurs after dawn. In October, the time of greatest fog incidence also occurs around dawn but, with less heat received from the sun than in August, a few fogs persist into the afternoon.

The fogs experienced at low levels are either sea-fogs that have moved in from the North Sea or radiation fogs formed as a result of light winds and clear skies at night. Upland areas are more often affected by low cloud, and visibilities can be reduced considerably, particularly when it is raining or snowing. These hill fogs can also be very persistent, often not clearing until the overall weather pattern changes.

Average number of days per month on which visibility was less than 200 m at the indicated time: Edinburgh Airport 1961–80.



WIND

In a country of such varied topography as Scotland, wind statistics are extremely dependent on local geographical features. Measurements of wind speed and direction are made at several places in the area covered by this memorandum but at each site the data show variations in both speed and direction due to the effects of surrounding topography. This means that a simple description of the wind regime applicable to the whole area is not possible. The effects of topography are well illustrated by considering the wind records from Edinburgh Airport. Table 7 shows the annual

TABLE 7 Annual percentage frequencies of hourly mean wind speed and direction for Edinburgh Airport during the period 1961–80

	30° sectors centred on												All directions
	360°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	
Calm													3.6
1– 3 knots													12.6
4–10 knots	1.3	4.1	7.1	3.4	1.7	1.2	1.6	3.7	12.0	5.4	1.7	1.5	44.7
11–21 knots	0.6	1.2	3.7	2.4	0.7	0.4	1.1	5.3	13.7	4.8	0.7	0.7	35.3
22–33 knots	0+	0+	0.2	0.1	0+	0+	0.2	0.6	1.6	0.8	0+	0+	3.5
⩾ 34 knots				0+		0+	0+	0+	0+	0+			0.1
Total ⩾ 4 knots	1.9	5.3	11.0	5.9	2.4	1.6	2.9	9.6	27.3	11.0	2.4	2.2	

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

percentage frequency of hourly mean wind speed and direction. The directions have been divided into 30° sectors and the speeds into groupings on the Beaufort scale.

Edinburgh Airport lies at an altitude of about 30 metres in the valley of the River Almond, which runs roughly south-west/north-east. Ten kilometres or so to the south are the Pentland Hills, aligned along much the same direction. Within 5 kilometres of the airport to the east is Corstorphine Hill, rising to 150 metres, on the western edge of Edinburgh. These topographic features have a clear effect on the winds measured at the airport. There are high frequencies from around 060° and from between 210° and 270°, indicating both a steering of wind by the Pentland Hills and a channelling up and down the valley. There are low frequencies of wind from the sheltered directions between east and south. Examination of wind data from the recorder in the middle of the Forth Road Bridge, some 6 kilometres north-west of the airport, indicates a similar overall pattern, except that easterly and westerly winds are appreciably stronger here because of the very open exposure up and down the Forth estuary.

Despite these difficulties the wind speeds measured at Edinburgh Airport give a general guide to winds likely to be encountered over the lower ground in the area. However, wind speeds considerably in excess of those recorded at the airport are experienced over the higher ground and also over any exposed areas of low ground. Short-period records from Inchterf (near Kirkintilloch), for example, show roughly twice the frequency of winds of Beaufort force 6 and above (22 knots or more) than is recorded at Edinburgh Airport, whilst the anemometers at the centre of the Forth Road Bridge (66 metres) and Edinburgh's Royal Observatory at Blackford Hill (134 metres) record over three times the frequency of winds of this magnitude. Blackford Hill is perhaps typical of the more exposed areas of the city, and wind speeds recorded here are around 20 to 40 per cent higher than at the airport.

Seasonal variations can be appreciable, both in speed and direction. The winter months experience the strongest winds, usually from the south-west, and there is a substantial increase in the frequencies of north-easterlies in the spring. These variations can be seen below in the wind-roses (graphical representations of frequency tables) for Edinburgh Airport.

Wind speeds also display a diurnal variation, being generally greater in the daytime than at night. This is due to the effect of solar heating which increases the vertical mixing of the air in the lowest layers of the atmosphere and so allows the influence of stronger winds aloft to be felt nearer the surface. This variation is at a maximum in the summer months when solar heating is greatest and the data show that, at Edinburgh Airport in July, 50 per cent of hourly mean wind speeds in the middle of the day (1200–1500 GMT) are over 11 knots whereas only 17 per cent are above this threshold at night (0000–0300 GMT). In January, the range of frequencies is less, being from 40 per cent over 11 knots at night to 50 per cent in the daytime.

Another cause of diurnal variation in both speed and direction is the sea-breeze – an onshore wind caused by the differential heating of the land and sea surfaces. This, too, is essentially a feature of the warmer months of the year and is explained more fully in the Introduction to this series. It is most noticeable around the coast of East Lothian, and may extend tens of kilometres inland on sunny days.

Edinburgh Airport experiences an average of about 9 days with gales per year, with most of these occurring in the months December to March. One of the most noteworthy gales in the Edinburgh area was the storm of 15 January 1968 when an hourly mean speed of 62 knots (Beaufort force 11) and a gust of 90 knots were recorded at the airport. More recently, in December 1979, a gust of 96 knots (110 mph) and a mean speed of 60 knots were recorded at the Royal Observatory, Blackford Hill. Much higher speeds are experienced on exposed hilltops in upland areas. For example, the wind recorder mounted 27 metres above the summit of Lowther Hill (725 metres in the Southern Uplands) registered an extreme gust of 116 knots and an hourly mean speed of 84 knots on 2 January 1976.

Wind-roses for Edinburgh Airport over the period 1961–80.

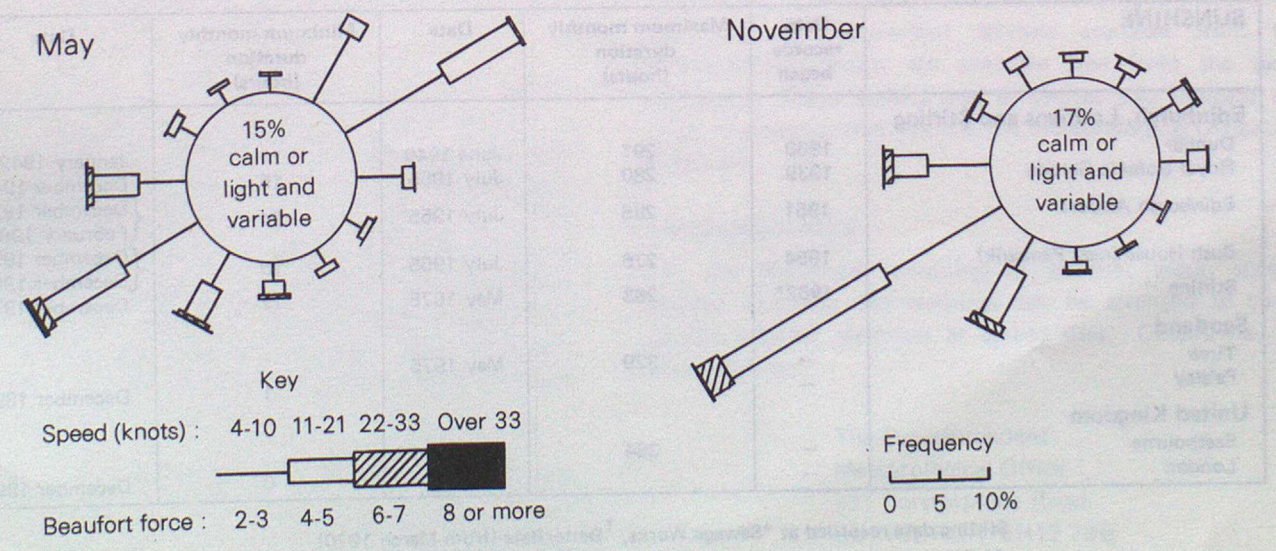


TABLE 8 Weather extremes

TEMPERATURE	Date records began	Maximum daily temperature (°C)	Date	Minimum daily temperature (°C)	Date
Edinburgh, Lothians and Stirling					
Dunbar	1930	31.1	1 July 1943	−12.9	4 March 1947
Royal Botanic Garden	1939	30.0	4 August 1975	−15.6	6 January 1941
Edinburgh Airport	1947	31.4	4 August 1975	−17.4	10 January 1982
Penicuik	1943	29.4	31 July 1943 4 August 1975	−19.2	11 January 1982
Stirling	1918	30.6	27 July 1955	−17.2†	11 January 1982
Callander	1966	30.9	8 August 1975	−16.0**	11 January 1982
Scotland					
Dumfries	–	32.8	2 July 1908		
Braemar	–			−27.2	11 February 1895 10 January 1982
United Kingdom					
Raunds, Epsom and Canterbury	–	36.7	9 August 1911		
Braemar	–			−27.2	11 February 1895 10 January 1982

WIND	Date records began	Maximum hourly mean wind speed (knots)	Date	Gust speed (knots)	Date
Edinburgh, Lothians and Stirling					
Edinburgh Airport	1962	62	15 January 1968	90	15 January 1968
Inchterf	1974	38	29 January 1978	67	20 January 1976
Forth Road Bridge	1966	68	15 January 1968	94	15 January 1968
United Kingdom (Low-level sites only)					
Dounreay (Caithness)	–	69	28 September 1968		
St. Ann's Head (Dyfed)	–	69	23 November 1938		
Kirkwall (Orkney)	–			118	7 February 1969

RAINFALL	Date records began	Maximum daily fall (mm)	Date
Edinburgh, Lothians and Stirling			
Dunbar	1930	71.4	3 August 1966
Royal Botanic Garden	1939	52.3	10 July 1940
Edinburgh Airport	1947	57.1	25 October 1949
Penicuik	1943	98.3	19 March 1971
Stirling (Sauchie House)	1918	64.5	17 August 1920
Loch Vennachar	1961	65.0	18 June 1973
Scotland			
Sloy Filters (Loch Lomondside, Strathclyde)	–	238	17 January 1974
United Kingdom			
Martinstown (Dorset)	–	279	18 July 1955

SUNSHINE	Date records began	Maximum monthly duration (hours)	Date	Minimum monthly duration (hours)	Date
Edinburgh, Lothians and Stirling					
Dunbar	1930	291	June 1940	11	January 1942
Royal Botanic Garden	1939	280	July 1955	15	December 1947
Edinburgh Airport	1951	285	July 1955	24	December 1978 February 1980
Bush House (near Penicuik)	1954	276	July 1955	18	December 1956 December 1959
Stirling	1962*	263	May 1975	12	December 1978
Scotland					
Tiree	–	329	May 1975		
Paisley	–			1	December 1890
United Kingdom					
Eastbourne	–	384	July 1911		
London	–			0	December 1890

Stirling data recorded at *Sewage Works, †Batterflats (from March 1970)

** Callander data from Loch Vennachar (from 1982)

TABLE 9 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) # Minimum Jan.	Minimum July	Maximum Jan.	Maximum July	Average annual duration of bright sunshine (hours)	Average annual no. of days with* 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.

† For Braemar.

x For Regents Park.

\# 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). 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 on all aspects of past weather data should be directed to the appropriate address given on page 18. 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 Superintendent
Meteorological Office
231 Corstorphine Road
EDINBURGH EH12 7BB

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

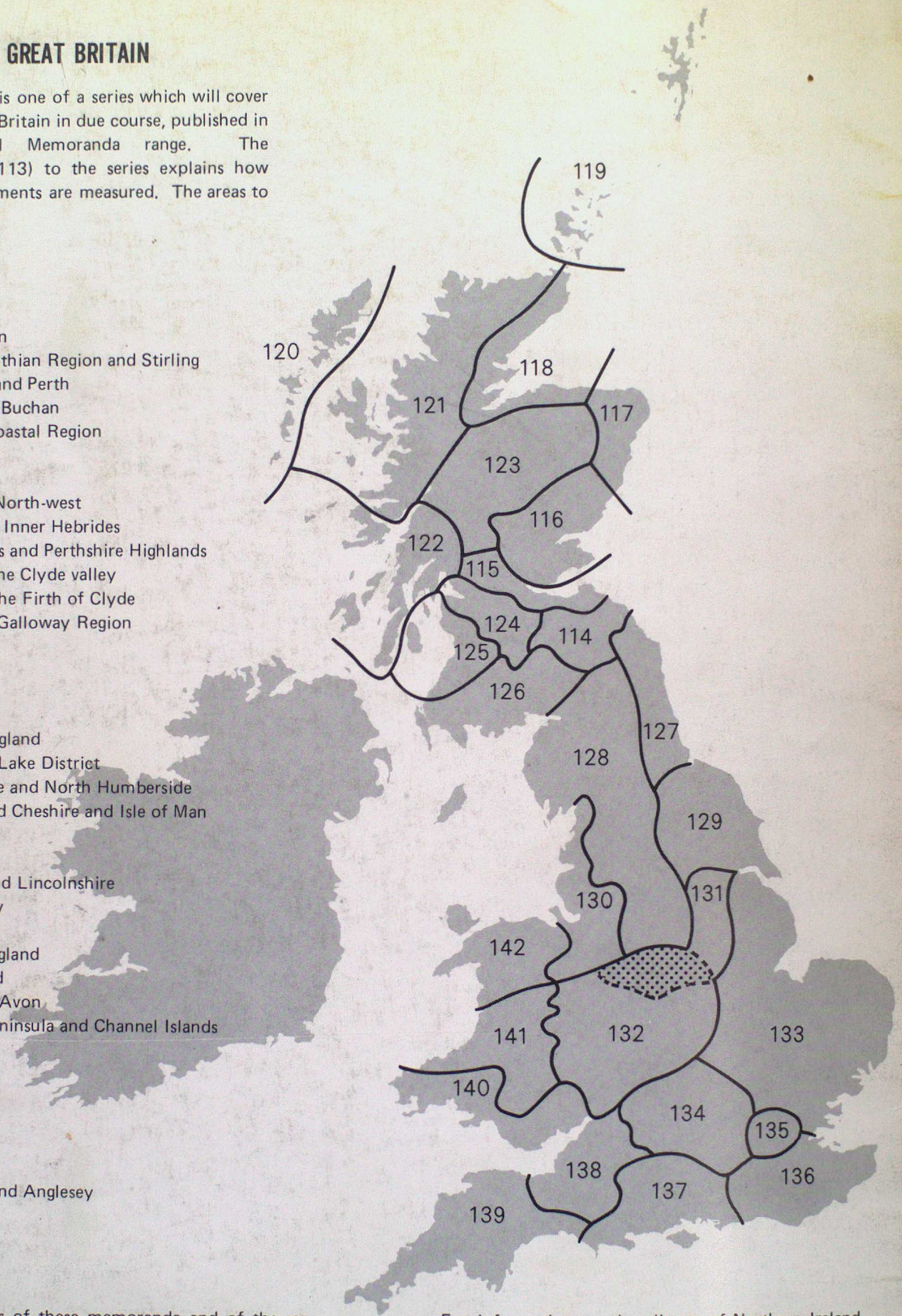
114 Borders Region
115 Edinburgh, Lothian Region and Stirling
116 Fife, Dundee and Perth
117 Aberdeen and Buchan
118 Moray Firth coastal Region
119 Northern Isles
120 Western Isles
121 Skye and the North-west
122 Argyll and the Inner Hebrides
123 The Grampians and Perthshire Highlands
124 Glasgow and 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
136 South-east England
137 South England
138 Somerset and Avon
139 South-west Peninsula and Channel Islands

WALES

140 South Wales
141 Mid Wales
142 North Wales and Anglesey



Further details of these memoranda and of the services mentioned on page 17 can be obtained from:

FOR ENGLAND AND WALES

The Director General
Meteorological Office (Met O 3b)
London Road
Bracknell
Berkshire RG12 2SZ

FOR SCOTLAND

The Superintendent
Meteorological Office
231 Corstorphine Road
Edinburgh EH12 7BB

For information on the climate of Northern Ireland please contact:

The Senior Meteorological Officer
Progressive House
1 College Square East
Belfast BT1 6BQ