THE CLIMATE OF GREAT BRITAIN

WALES

Climatological Memorandum 140

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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. Much of Wales had 8 to 10 hours of sunshine with maximum afternoon temperatures between 9 and 12 ^{o}C. A few places, chiefly in North Wales, had a few rain or hail showers and only some 5 to 8 hours of sunshine.

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Climatological Memorandum 140

This memorandum covers the three memoranda 140–142 originally planned

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 20.

CONTENTS

Met O 3 (Advisory Services)
March 1988

THE AREA

Wales is a mainly mountainous country with much of the land being over 122 metres. Snowdon at 1085 metres is the highest mountain in England and Wales and in the south the Brecon Beacons rise to 885 metres. The rivers drain radially from the mountains, the Severn being the longest river in England and Wales. Most of the lowland areas are found around the coasts or in the deeper valleys. The mountainous nature of the landscape means that communication routes are few with large areas only sparsely populated. The effects of glaciation are widespread with many lakes of tarns and other features and also a great variation in soil depths. Agriculture is mainly confined to the low-lying areas with the upland areas being devoted largely to sheep. There is dairying and mixed farming with arable crops including barley and wheat.

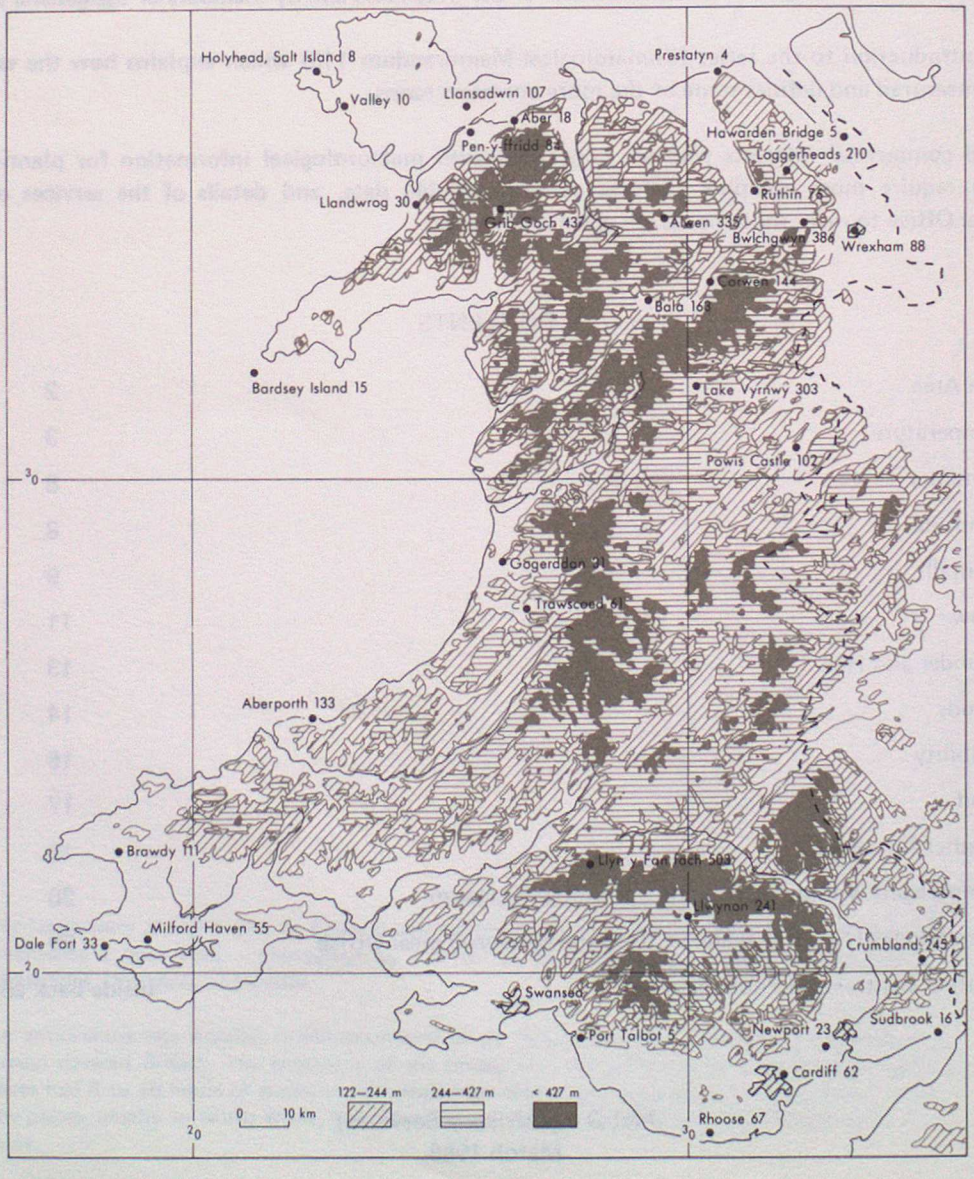
In the 1930s South Wales was the world's leading producer of coal and this was the main cause for the great development of industry and for the very high density of population. Nearly half of the population of Wales lives in the area of the South Wales coalfield. The use of oil and other fuels has led to a decline in the coal industry with the number of pits falling from over 200 in 1946 to under 50 in 1980. South Wales is a major steel-producing area in Britain, making over one-quarter of the crude steel. There are oil terminals at Milford Haven and Wylfa, Anglesey which is also the site of a nuclear power station. Wales also contains a number of hydroelectric power stations and some of its reservoirs provide water for major towns in England and Wales.

Cardiff, the capital of Wales since 1955, is also the legal and administrative centre. It is situated at the lowest bridging point of the River Taff and first became important as a coal port. Swansea and Newport are the other main towns.

When this series was first planned it was intended to have three Climatological Memoranda covering Wales. However, the sparseness of data received from some parts of Wales made this impractical.

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

Topography of the area giving locations and altitude (in metres) of the stations. Co-ordinates are national grid references.



TEMPERATURE

Over Wales the mean annual temperature at low altitudes varies from about 9.5 °C to 10.5 °C with the higher values occurring around or near to the coasts. The mean annual temperature decreases by approximately 0.5 °C for each 100-metre increase in altitude so that, for example, Bwlchgwyn, Clwyd at 386 metres has an annual mean temperature of 7.3 °C. On this basis Snowdon at 1085 metres would have an annual mean temperature of about 5 °C.

Temperature shows both a seasonal and diurnal variation. The sea reaches its lowest temperature in late February or early March so that around the coasts February is normally the coldest month. Away from the coast there is very little to choose between January and February as the coldest month. The lowest mean daily temperatures in these months range from 2 °C to 3.5 °C along the coastal areas to 1 °C or less inland in North Wales but with a decrease of about 0.5 °C for each 100-metre increase in altitude.

Minimum temperatures usually occur around sunrise. Extreme minimum temperatures normally occur in January or February. The extreme minimum temperature recorded in Wales was –23.3 °C on 21 January 1940 at Rhayader. By way of contrast the lowest temperature ever recorded at Bardsey Island was –6.1 °C on 15 February 1979.

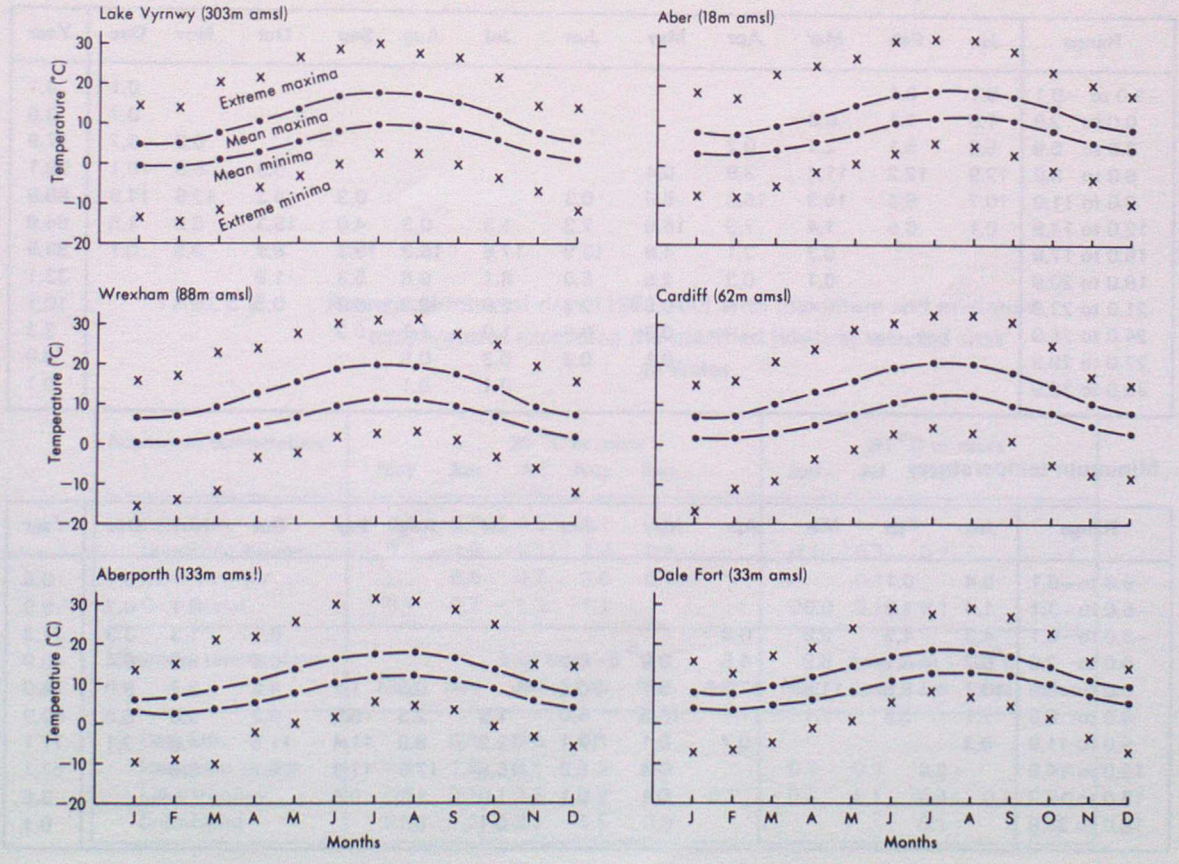
July is the warmest month with mean maximum daily temperatures varying from 18 °C along the west coast of Wales to 21 °C in the east of Powys and Gwent. Once again there is a decrease of about 0.5 °C for each 100-metre increase in altitude.

Maximum temperatures normally occur 2 or 3 hours after midday, and extreme maximum temperatures normally occur in July but have also occurred in June and August. The highest known temperature recorded in Wales was 33.9 °C at Newport, Gwent on 12 July 1923.

Some of the highest winter temperatures in the British Isles have been recorded in North Wales and they include 18.3 °C at Aber on 10 January 1971 which is the highest known air temperature recorded in the United Kingdom in January. These temperatures are due to the fohn – a warm, dry wind which occurs to leeward of a ridge of mountains.

The variation of mean daily maximum and minimum temperature, together with the extremes of temperature recorded at six locations in Wales, are shown in Figure 1. The set of curves give a good indication of the variations which occur owing to differences in altitude and proximity to the sea. Dale Fort and Aber, both at low altitude on the coast, have the smallest range of mean temperatures over the year, being relatively warm in winter but relatively cool in summer owing to the modifying influence of the sea.

FIGURE 1 **Annual variation of maximum and minimum temperatures at selected sites together with extreme temperatures for the stated periods**



A comparison of the data for Aberporth and Lake Vyrnwy shows that in summer Aberporth has lower average daily maximum temperatures but higher average daily minimum temperatures. In winter Lake Vyrnwy has colder average daily maximum and minimum temperatures than Aberporth. This comparison illustrates the variations due to different geographic locations.

Table 1 gives the average number of days each month of maximum and minimum temperatures at Valley and Crumbland in specified ranges. The most striking feature about the Table is the wide range of both maximum and minimum temperatures at any time of year. The modifying influence of the sea means that the range of temperatures is less at Valley than at Crumbland which has more occasions (but only just) of both low and high temperatures.

Table 2 gives the average number of days temperatures exceeded certain limits at four locations in Wales. Dale Fort on the coast of Dyfed had the least number of both high and low temperatures. Hawarden Bridge, the lower-lying of the inland stations, had the most occasions of high temperatures but nearly as many low-temperature days as Lake Vyrnwy, the highest of the four locations.

The average number of days each year of air frost in Wales varies widely depending on the location. Sites along the west coast have 25 days or fewer, Bardsey Island having just over 6 days. Away from the coast the figures range from 45 to 100 days generally increasing with distance from the coast. The average number of days of ground frost each year varies from 22 at Bardsey Island to 141 at Alwen, these figures being the lowest and highest values for climatological stations in Wales. Local topography plays an important role and there can be wide variations over relatively short distances; for example, Aber averages 62.1 days of ground frost a year and Pen-y-Ffridd 124.7, the two sites being only some 6 miles apart on the Menai Strait. See also the Introduction to the series.

TABLE 1 **Average number of days of maximum and minimum temperatures (°C) in ranges specified for the period 1961–80**

Valley

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−3.0 to −0.1	0.1	0.1										0.1	0.1
0.0 to 2.9	1.5	1.1	0.3									0.7	3.6
3.0 to 5.9	5.8	5.1	2.1	0.2							0.9	3.7	17.9
6.0 to 8.9	12.9	12.2	11.4	3.9	0.4					0.3	6.9	10.1	58.1
9.0 to 11.9	10.7	9.3	15.3	15.6	5.6	0.3			0.3	4.3	12.9	14.9	88.9
12.0 to 14.9	0.1	0.5	1.4	7.9	16.5	7.3	1.3	0.3	4.0	15.3	8.8	1.5	64.9
15.0 to 17.9			0.3	2.1	4.8	13.9	17.6	16.3	19.3	8.9	0.5	0.1	83.9
18.0 to 20.9			0.1	0.3	2.5	5.0	8.1	9.8	5.3	1.8			33.1
21.0 to 23.9					0.9	2.4	2.6	2.9	0.9	0.5			10.1
24.0 to 26.9					0.3	0.8	1.0	1.1	0.3				3.3
27.0 to 29.9					0.1	0.2	0.3	0.5					0.9
30.0 to 32.9							0.1	0.1					0.1

Minimum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−9.0 to −6.1	0.4	0.1										0.1	0.5
−6.0 to −3.1	1.4	1.3	0.3								0.1	0.7	3.9
−3.0 to −0.1	4.3	4.5	2.9	0.9						0.1	1.3	3.3	17.3
0.0 to 2.9	6.7	8.1	8.9	4.5	0.9	0.1				0.5	5.0	6.4	40.9
3.0 to 5.9	10.7	8.8	11.8	12.3	5.1	0.8		0.3	1.1	4.5	8.7	9.9	74.0
6.0 to 8.9	7.1	5.5	7.1	11.7	16.5	6.0	1.9	2.3	5.5	9.2	9.6	8.5	90.9
9.0 to 11.9	0.3			0.7	8.1	17.1	12.2	8.9	11.4	11.5	4.8	2.1	77.1
12.0 to 14.9					0.4	5.9	15.8	17.8	11.3	5.3	0.5		57.1
15.0 to 17.9					0.1	0.1	1.0	1.7	0.6				3.5
18.0 to 20.9							0.1	0.1					0.1

TABLE 1 continued

Crumbland

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−3.1 or less	0.4	0.1										0.1	0.5
−3.0 to −0.1	1.7	1.4	0.2								0.1	1.3	4.5
0.0 to 2.9	6.3	5.7	2.3	0.2							0.9	4.4	19.7
3.0 to 5.9	7.1	6.3	5.1	1.3						0.1	5.3	6.7	31.8
6.0 to 8.9	11.4	9.8	10.9	6.1	0.7	0.1			0.1	2.5	10.6	10.7	62.9
9.0 to 11.9	4.1	4.9	9.5	11.5	6.6	1.0		0.1	1.3	8.9	8.8	7.3	64.1
12.0 to 14.9	0.1	0.2	2.0	7.9	12.4	4.7	1.3	1.6	7.5	12.5	4.1	0.5	54.7
15.0 to 17.9			0.7	2.3	6.7	11.3	10.4	11.9	14.3	6.3	0.1		64.1
18.0 to 20.9			0.2	0.7	3.3	7.5	10.9	11.3	5.6	0.7			40.1
21.0 to 23.9				0.1	1.2	4.1	6.1	4.3	1.3	0.1			17.0
24.0 to 26.9					0.1	0.9	1.9	1.4	0.1				4.3
27.0 to 29.9						0.3	0.3	0.4					0.9
30.0 to 32.9						0.1	0.1	0.1					0.3

Minimum temperatures

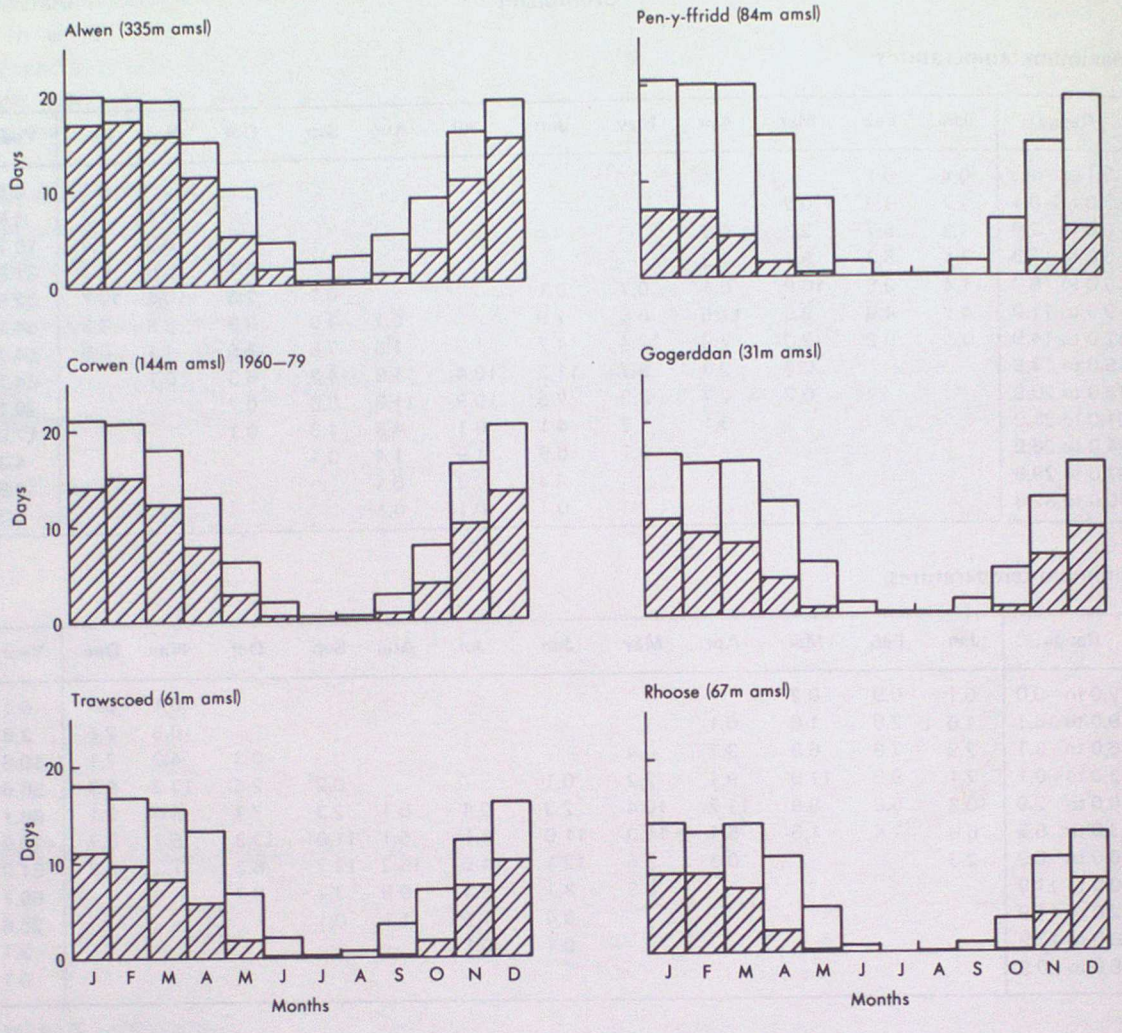
Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−12.0 to −9.0	0.1	0.9	0.2								0.1	0.7	0.1
−9.0 to −6.1	1.6	2.9	1.6	0.1							0.5	2.5	3.5
−6.0 to −3.1	2.9	7.9	6.8	3.1	0.4					0.3	4.0	7.1	10.6
−3.0 to −0.1	7.1	9.5	11.9	9.1	2.2	0.1			0.2	2.6	10.3	9.7	36.6
0.0 to 2.9	10.3	5.5	8.9	11.7	10.4	2.3	0.4	0.1	2.3	7.7	8.0	7.1	66.1
3.0 to 5.9	6.9	1.4	1.5	5.7	14.3	11.9	6.1	5.1	11.0	13.3	5.7	3.7	70.9
6.0 to 8.9	2.3			0.3	3.5	12.1	14.5	15.2	12.7	6.5	1.3	0.3	81.9
9.0 to 11.9					0.3	3.1	8.3	9.5	3.7	0.7			66.7
12.0 to 14.9						0.4	1.5	1.1	0.1				25.6
15.0 to 17.9						0.1	0.1						3.1
18.0 to 20.9													0.1

TABLE 2 Average number of days (1961–80) with maximum and minimum temperatures exceeding the specified limits at selected sites in Wales

Maximum temperature	25 °C or more					30 °C or more		
	May	Jun	Jul	Aug	Sep	Jun	Jul	Aug
Dale Fort	0.3	0.4	0.5	0.1				
Hawarden Bridge	0.3	1.9	2.1	2.4	0.3	0.1	0.3	0.2
Lake Vyrnwy		0.5	0.7	0.6	0.1		0.1	
Crumbland	0.1	0.7	1.3	1.1		0.1	0.1	0.1

Minimum temperature	Less than −5 °C						Less than −10 °C				
	Nov	Dec	Jan	Feb	Mar	Apr	Nov	Dec	Jan	Feb	Mar
Dale Fort		0.1	0.5	0.1							
Hawarden Bridge	0.3	1.9	2.1	1.2	0.3		0.1	0.3	0.5		0.1
Lake Vyrnwy	0.5	2.1	3.5	2.2	1.3	0.1	0.1	0.1	0.4	0.1	0.1
Crumbland	0.1	1.2	2.3	1.5	0.5				0.1		

FIGURE 2 **Average number of days with air frost (hatched areas) and ground frost (whole columns) at selected sites over the period 1961–80**



HUMIDITY

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

The relative humidity in Wales averages around 85 per cent over the year with higher values occurring in winter and by night. This is primarily a reflection of the seasonal and diurnal temperature changes. Over much of Wales a relative humidity of 95 per cent is exceeded for 20 to 30 per cent of the time, and 100 per cent can be reached in fog and persistent rain, snow or drizzle. Low humidities are less common as the data in Figure 3 show. This gives the percentage of time in the period 1971–80 that relative humidities in the specified ranges occurred at Valley. The 16–20 per cent range represents just 3 hours in that period out of a total of 87 670 hours.

Figure 4 shows the average diurnal variation of relative humidity and temperature at Rhoose for the months of January and July; this illustrates a number of the points made in the text.

FIGURE 3 Percentage of times relative humidity occurred in the ranges specified at Valley during the period 1971–80

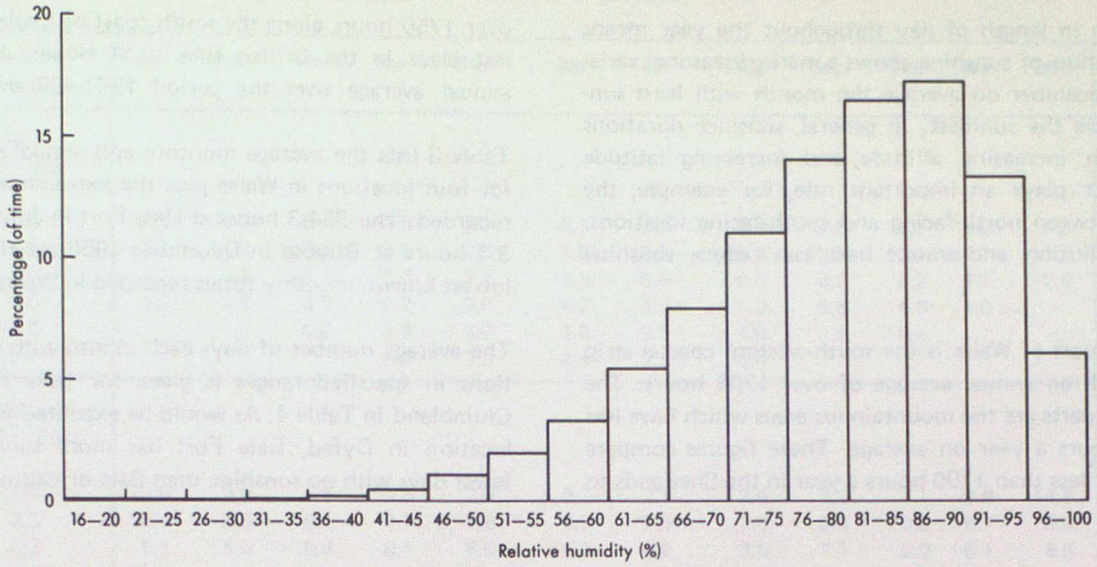
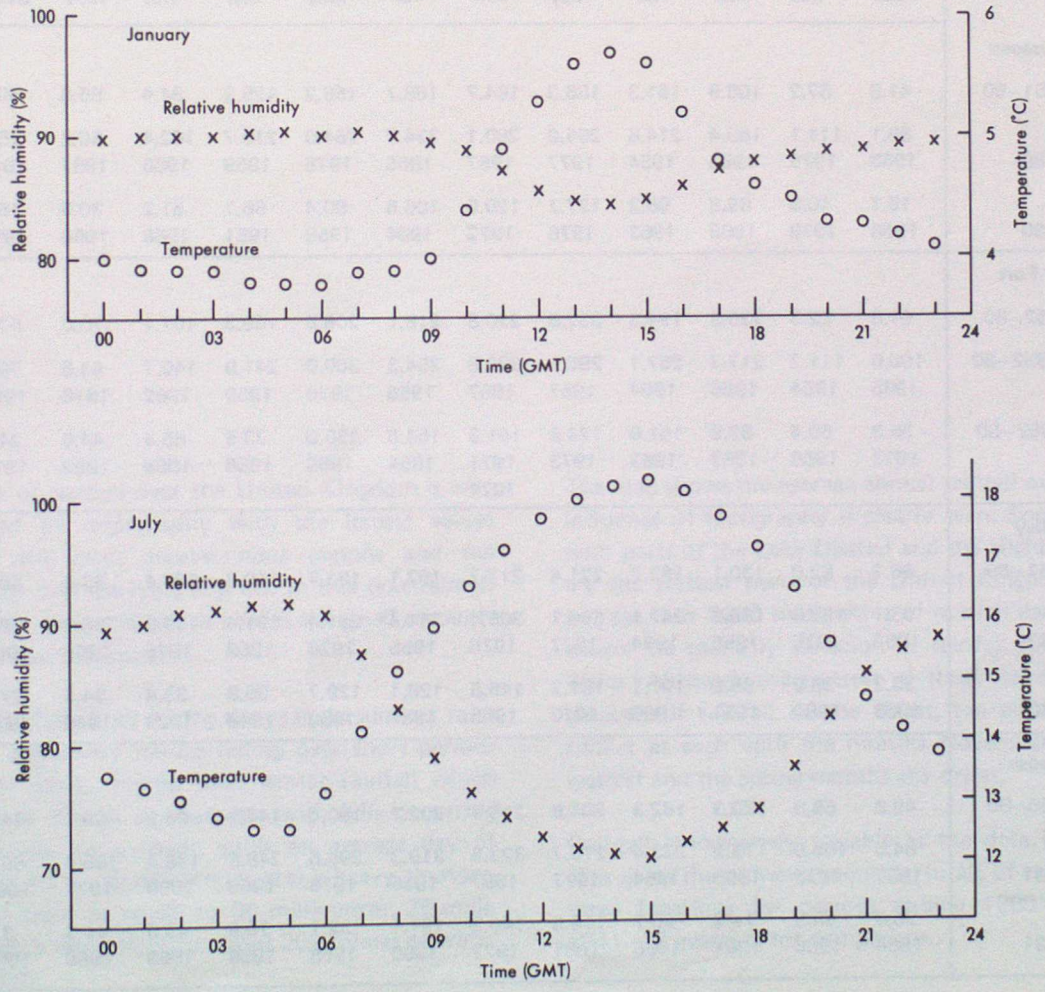


FIGURE 4 Average diurnal variation of temperature and relative humidity at Rhoose for January and July over the period 1961–80



SUNSHINE

The variation in length of day throughout the year means that the duration of sunshine shows a marked seasonal variation, with December on average the month with least sunshine and June the sunniest. In general, sunshine durations decrease with increasing altitude and increasing latitude though aspect plays an important role, for example, the difference between north-facing and south-facing locations. Industrial pollution and smoke haze can reduce sunshine amounts.

The sunniest part of Wales is the south-western coastal strip of Dyfed with an annual average of over 1700 hours. The least sunniest parts are the mountainous areas which have less than 1200 hours a year on average. These figures compare with values of less than 1100 hours a year in the Shetlands to over 1750 hours along the south coast of England. The sunniest place in the British Isles is St Helier, Jersey with an annual average over the period 1951–80 of 1928 hours.

Table 3 lists the average monthly and annual sunshine totals for four locations in Wales plus the extreme monthly values recorded. The 354.3 hours at Dale Fort in July 1958 and the 3.3 hours at Rhoose in December 1956 are the highest and lowest known monthly totals recorded in Wales.

The average number of days each month with sunshine durations in specified ranges is given for Dale Fort, Bala and Crumbland in Table 4. As would be expected from its coastal location in Dyfed, Dale Fort has more sunnier days and fewer days with no sunshine than Bala or Crumbland.

TABLE 3 **Average monthly and annual totals of duration (hours) of bright sunshine at selected sites over the stated periods together with extreme values for stated years**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Trawscoed													
Averages 1951–80	41.9	67.2	108.9	151.3	186.3	184.7	168.7	158.2	125.2	94.4	55.6	39.2	1381.6
Maximum June 1950–80	88.1 1963	111.1 1975	169.4 1953	214.6 1954	265.0 1977	280.1 1957	334.7 1955	264.0 1976	213.7 1959	162.4 1965	80.2 1967	75.9 1961	1736.5 1955
Minimum June 1950–80	19.1 1968	40.9 1978	66.8 1966	96.2 1963	137.7 1976	120.5 1972	106.5 1954	80.4 1958	66.1 1951	51.2 1968	30.5 1966	16.8 1950	1131.8 1958
Dale Fort													
Averages 1952–80	61.8	82.5	135.3	194.3	232.6	230.8	218.1	206.5	159.3	107.1	70.0	53.6	1751.9
Maximum 1952–80	100.0 1965	111.2 1954	217.7 1955	257.1 1954	290.1 1957	326.8 1957	354.3 1955	309.0 1976	241.9 1959	140.7 1962	93.6 1976	79.5 1963	2130.6 1955
Minimum 1952–80	35.3 1973	50.4 1958	83.9 1957	161.0 1963	173.5 1973	161.3 1971 1974	154.5 1954	135.0 1958	73.5 1956	65.4 1968	44.6 1962	24.8 1972	1498.2 1958
Valley													
Averages 1951–80	56.7	82.0	130.1	182.2	221.4	217.7	192.1	183.7	140.3	104.4	63.5	49.3	1623.4
Maximum July 1946–80	93.1 1963	133.8 1975	195.6 1955	247.1 1974	306.1 1977	305.4 1975	341.4 1955	291.4 1976	191.4 1959	139.9 1975	88.8 1965	79.6 1960	1899.0 1975
Minimum July 1946–80	33.2 1968	38.9 1980	85.5 1951	127.1 1966	161.2 1970	146.8 1955	128.1 1954	129.7 1980	95.9 1948	53.4 1968	34.3 1946	27.3 1975	1379.4 1958
Rhoose													
Averages 1955–80	49.8	68.8	120.3	162.3	204.9	216.1	202.2	190.4	144.5	96.2	69.1	44.6	1569.4
Maximum April 1954–81	84.5 1959	105.6 1970	172.2 1955	233.4 1954	275.7 1977	323.4 1957	319.3 1955	298.5 1976	248.8 1959	138.4 1959	106.4 1971	65.2 1961	1834.7 1955
Minimum April 1954–81	25.6 1964	38.8 1966	74.2 1981	90.7 1966	119.5 1981	140.2 1972	131.1 1965	132.7 1958	70.8 1956	45.0 1968	41.3 1958	3.3 1956	1335.0 1958

TABLE 4 Average number of days with sunshine hours in ranges specified at selected sites for the stated periods

Duration (Hours per day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Bala (1970–80)													
Nil	13.4	8.8	5.9	3.5	2.3	3.2	2.7	2.4	2.8	6.3	9.8	14.8	75.1
0.1 to 3.0	13.3	11.9	12.3	9.5	7.5	7.5	9.9	10.3	10.9	12.1	14.1	13.3	132.5
3.1 to 6.0	4.2	5.3	6.7	6.5	7.1	6.8	6.6	6.6	8.2	6.3	5.1	2.9	73.1
6.1 to 9.0	0.2	2.3	5.3	6.2	5.9	4.2	4.3	6.0	6.5	4.6	1.0		47.1
9.1 to 12.0			0.8	3.9	5.0	3.9	5.3	4.9	1.6	0.6			26.5
12.1 or more				0.3	3.3	4.4	2.1	0.8					11.0
Crumbland (1961–80)													
Nil	13.6	9.9	6.4	4.6	2.8	2.7	2.1	2.4	3.3	7.1	9.8	14.6	79.1
0.1 to 3.0	10.0	8.9	9.7	7.7	7.9	6.6	7.5	7.8	9.3	10.2	9.7	9.0	104.5
3.1 to 6.0	5.1	5.5	5.8	6.1	5.5	5.3	6.9	6.5	7.1	6.9	6.1	5.6	72.4
6.1 to 9.0	2.3	3.5	5.9	6.1	5.5	5.1	6.5	5.9	5.1	5.6	4.3	1.8	57.9
9.1 to 12.0		0.3	3.3	4.3	4.9	3.7	4.3	5.3	5.1	1.1			32.5
12.1 or more				1.3	4.5	6.5	3.6	2.9	0.1				18.9
Dale Fort (1961–80)													
Nil	11.5	8.2	5.7	3.3	2.9	3.0	2.7	2.4	2.9	6.3	8.5	11.5	69.0
0.1 to 3.0	11.3	8.5	8.4	5.9	5.1	5.3	5.7	5.9	8.1	9.5	10.9	11.1	95.6
3.1 to 6.0	5.3	6.3	5.4	4.8	4.4	4.3	4.3	4.8	5.1	7.1	7.3	6.1	65.3
6.1 to 9.0	2.9	4.7	7.1	6.3	5.5	4.3	6.5	6.3	7.2	6.7	3.3	2.2	62.8
9.1 to 12.0		0.5	4.5	7.4	6.3	5.3	5.7	7.5	6.5	1.5			45.2
12.1 or more				2.4	6.9	7.7	6.0	4.2	0.1				27.2

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 values in the low-lying regions. In this text rainfall also includes snow, sleet and hail as well as the small amounts from dew, hoar frost and rime.

The nature of 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 millimetres and a heavy thunderstorm lasting an hour or so 25 to 50 millimetres. 25 millimetres of rainfall is equivalent to about 200 tonnes of water on a football pitch.

The map shows the average annual rainfall over Wales and the influence of topography is clearly seen. Snowdonia together with parts of the Lake District and the Highlands of Scotland are the wettest parts of the United Kingdom, receiving on average over 3200 millimetres of rainfall each year. Figure 5 shows the monthly variation of rainfall for six locations in Wales. Although the wettest of these has some 5 times the amount of rainfall of the driest, the pattern of rainfall is similar at each with the months November to January the wettest and the spring months the driest.

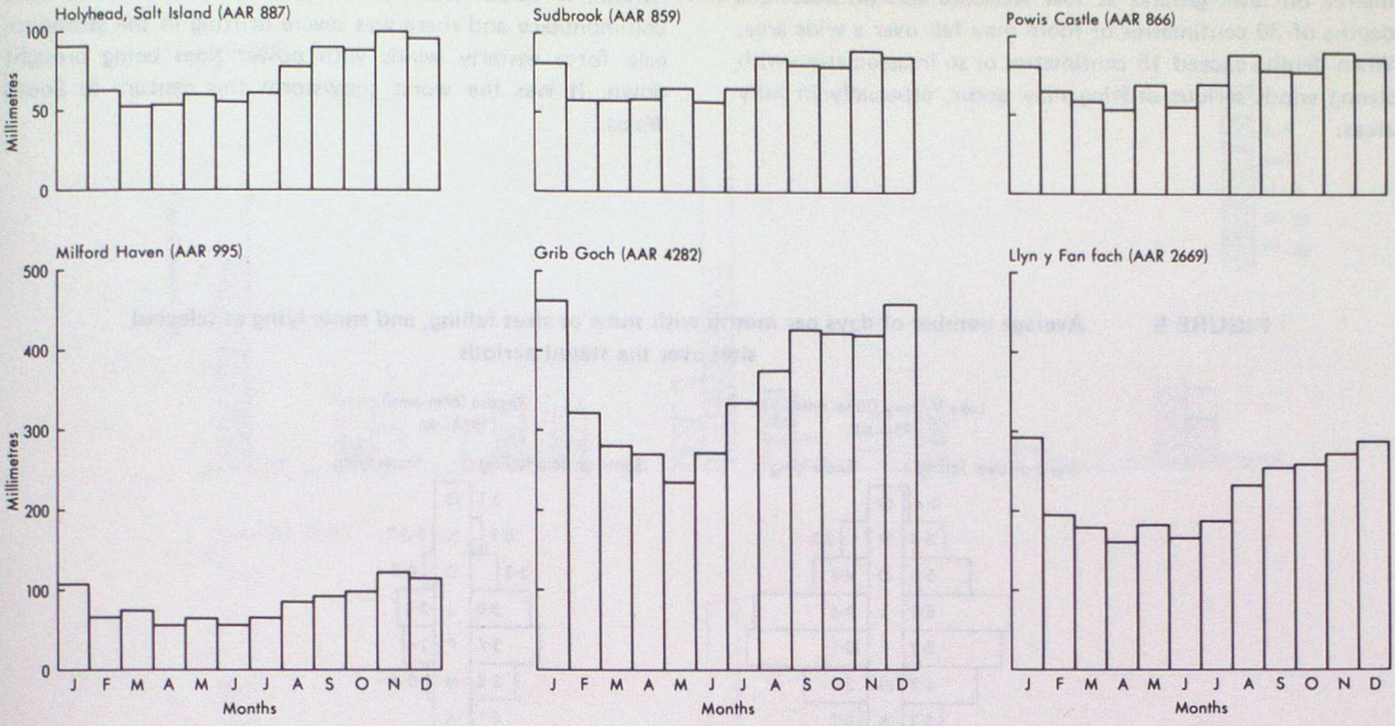
Rainfall is extremely variable as the data in Table 5 show. This gives the extreme monthly totals of rainfall recorded at three locations for periods ending 1980 or 81 with the 1941–70 averages for comparison.

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

TABLE 5 Average monthly and annual rainfall (mm) together with extreme values for selected sites for the stated periods

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Valley														
	Average	90	60	51	52	58	55	61	77	89	87	97	94	871
1931	Wettest	194.8	161.2	151.9	103.4	122.5	126.7	119.4	210.4	175.0	179.3	187.0	240.5	1056.6
–81	Driest	19.1	5.4	14.1	5.3	10.4	1.3	8.4	4.9	20.7	9.2	11.3	17.3	592.1
Rhoose														
	Average	94	63	58	59	65	58	75	99	89	92	98	97	947
1957	Wettest	138.8	136.3	159.4	127.7	148.0	151.3	168.0	149.0	223.5	212.7	215.2	208.0	1248.9
–81	Driest	18.5	1.8	13.0	3.1	19.9	5.4	13.5	22.6	13.6	11.4	46.6	38.5	691.6
Grib Goch (Snowdon)														
	Average	462	322	280	270	235	273	336	376	428	422	419	459	4282
1941	Wettest	858.2	668.0	600.0	596.9	530.0	482.6	868.7	782.3	901.7	886.5	825.5	812.8	5778.5
–80	Driest	33.0	19.1	116.8	25.4	27.9	49.5	116.8	27.9	53.3	66.0	68.6	99.1	3023.9

FIGURE 5 **Average monthly rainfall (mm) for selected stations over the period 1941–70**



AAR = Annual average rainfall

SNOW

The occurrence of snow is linked closely with temperature with falls rarely occurring in association with temperatures higher than 4 °C. The number of days with sleet or snow falling and snow lying show an increase with increasing latitude and with increasing altitude so that values strongly reflect the topographic pattern. There is an approximate increase of 5 days of sleet or snow falling and snow lying for each 100-metre increase in altitude for heights up to 400 metres. The sparseness of information above 400 metres does not allow any firm conclusions to be drawn on conditions at higher levels.

At low altitudes falls of sleet or snow are normally confined to the months November to April but a few occasions occur in October and May, on about one or two days in 10 years in Wales. Snow also very rarely occurs in June and some wintry showers on 2 June 1975 were the first observed in Wales at low altitudes this century.

The average number of days each year when sleet or snow falls in Wales ranges from about 10 or fewer in some south-western coastal areas to over 40 in Snowdonia. Snowfall amounts are measured as the equivalent water content and are included as such in the rainfall statistics. As a rough guide 10 centimetres of snow are equivalent to 1 centimetre of rainfall.

At low latitudes snow rarely lies on the ground before December or after March and the average number of days each year with snow lying in Wales varies from 6 or fewer around coasts to over 30 in Snowdonia. Days of snow lying are fewer than days of sleet or snow falling because in many cases when snow is falling the temperature of the air and the ground remains above freezing with the result that the snow never lies at all.

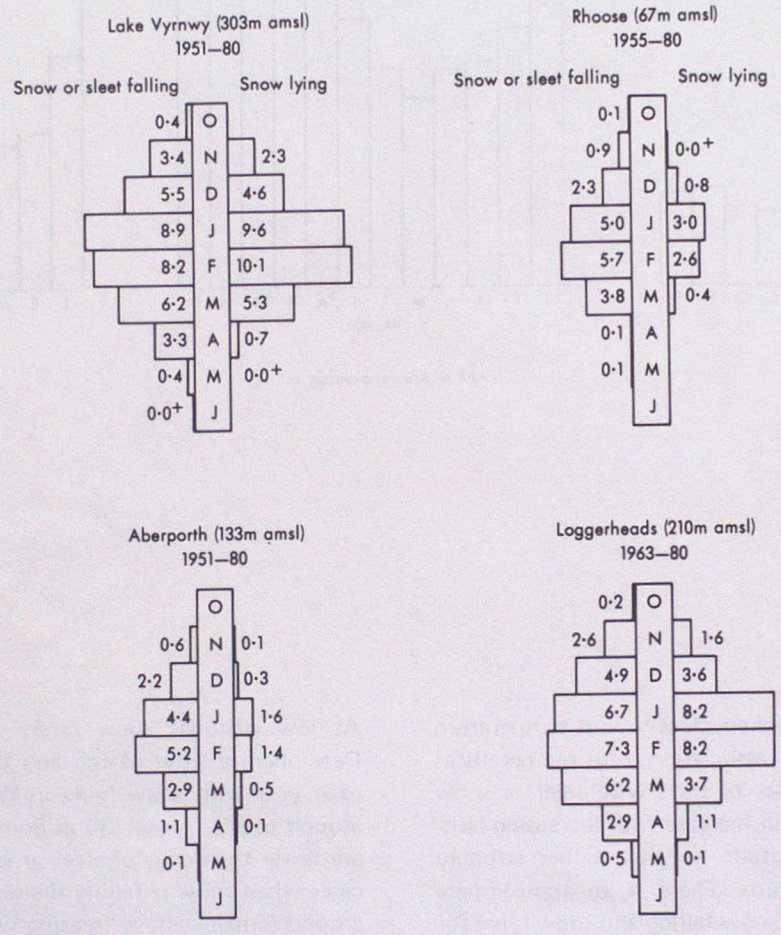
Figure 6 shows the average number of days with sleet or snow falling and snow lying at four locations in Wales. A day of snow lying is defined as one with snow covering at least half the ground at 0900 GMT.

Figure 7 shows the number of days of snow lying in various depths at Hawarden Bridge and Aberporth since the winter of 1946/47. These figures illustrate how the modifying influence of the sea causes Aberporth to have fewer days of lying snow than Hawarden Bridge despite its greater altitude. There is great variability in the number of days of lying snow at Hawarden Bridge with individual values ranging from none in two winters to 48 in the winter of 1946/47. As a comparison Balmoral, Grampian averages 60 days each winter with snow lying, 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 centimetres or more may fall over a wide area. When depths exceed 15 centimetres or so in association with strong winds serious drifting may occur, especially in hilly areas.

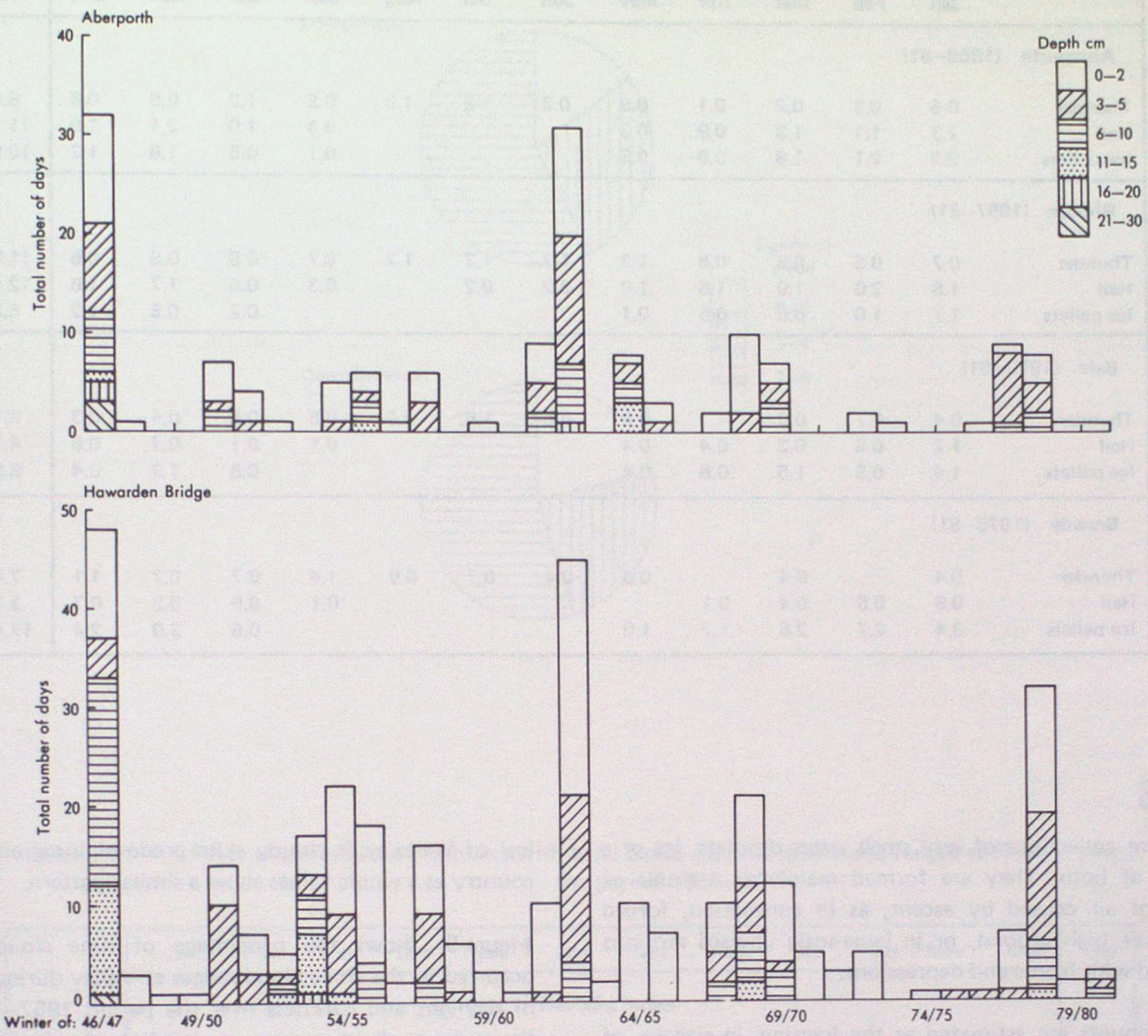
On 7 and 8 January 1982 a snowstorm affected much of Britain. In South Wales snow depths of 1 metre or so were commonplace and there was severe drifting in the strong-to-gale force easterly winds with power lines being brought down. It was the worst snowstorm this century in South Wales.

FIGURE 6 **Average number of days per month with snow or sleet falling, and snow lying at selected sites over the stated periods**



0·0+ = some occasions but less than 0·05

FIGURE 7 **Number of days with total snow depth at 0900 GMT in stated ranges at Aberporth and Hawarden Bridge**



THUNDER AND HAIL

Thunder and hail are phenomena associated with cumulonimbus clouds, which are clouds of great vertical extent. A typical thundercloud normally reaches at least 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 can occur at any time of the year but is more frequent during the summer months. The majority of thunderstorms are triggered by convective processes either overland in summer or over a comparatively warm sea in winter. Over Wales the number of thunderstorms increases from west to east with on average the western coastal areas having 4 to 6 a year and the eastern parts 10 to 12. Data on thunderstorms over Wales are sparse and there may be more variation in the occurrence than suggested. In thunderstorms or heavy showers at any time of the year the precipitation may be in the form of hard, clear or opaque ice called hail. Two varieties are recognized, the criterion being one of size: hail with a diameter of 5 millimetres or more and ice pellets with a diameter of less than 5 millimetres. Ice pellets are essentially a winter phenomenon, usually being associated with cold unstable air masses. Hail is generally a warm-weather phenomenon, tending to have a spring maximum as it usually melts before reaching the ground in summer. Table 6 gives the average number of days of thunder and both types of hail by month and year at four locations in Wales. Days of hail are extremely variable; for example, Aberporth had 28 days of hail in 1979 but none in 1972.

Although hail and thunder can occur simultaneously most thunderstorm precipitation is rain and the heaviest falls of rain over the British Isles are often associated with thundery situations. Two such falls in thundery situations in Wales were the 137 millimetres which fell in 3 hours at Llansadwrn, Anglesey on 10 August 1957 and 141 millimetres in 5 hours at Llandwrog, Caerns on 23 June 1937.

TABLE 6 Average number of days of thunder, hail and ice pellets at selected sites for the stated periods

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Aberporth (1959–81)													
Thunder	0.5	0.3	0.2	0.1	0.9	0.8	1.2	1.0	0.8	1.2	0.9	0.6	8.6
Hail	2.3	1.1	1.3	0.9	0.3				0.3	1.0	2.1	1.9	11.1
Ice pellets	2.2	2.1	1.8	0.9	0.3				0.1	0.5	1.8	1.2	10.9
Rhoose (1957–81)													
Thunder	0.7	0.5	0.3	0.5	1.3	1.3	1.7	1.7	0.7	0.8	0.8	0.6	11.0
Hail	1.8	2.0	1.9	1.6	1.0	0.2	0.2		0.3	0.5	1.7	1.6	12.8
Ice pellets	1.7	1.0	0.6	0.5	0.1					0.2	0.5	1.2	5.8
Bala (1970–81)													
Thunder	0.4	0.1	0.3		0.8	0.6	1.5	0.8	0.5	0.5	0.4	0.3	6.1
Hail	1.2	0.5	0.2	0.4	0.4				0.1	0.1	0.7	0.6	4.1
Ice pellets	1.4	0.5	1.5	0.6	0.4					0.8	1.3	0.4	6.9
Brawdy (1975–81)													
Thunder	0.4		0.4		0.6	0.4	0.7	0.9	1.4	0.7	0.7	1.1	7.4
Hail	0.6	0.6	0.4	0.1					0.1	0.9	0.3	0.7	3.7
Ice pellets	3.4	2.7	2.6	1.7	1.0					0.6	3.0	2.4	17.4

CLOUDS

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.

Figure 8 shows the percentage frequency throughout the year for cloud amounts at Aberporth. These values are typical of Wales with cloudy skies predominating and over the country as a whole values show a similar pattern.

Figure 9. shows the percentage of time cloud amounts occurred in the three cloud ranges at Valley during the hours of daylight and darkness over the period 1957–76. As the figure shows cloud amounts are less by night than by day and this is true over the British Isles in general.

Table 7 gives the percentage frequency by month for the hours of daylight and darkness at Rhoose. These are typical of the region being more cloudy in winter than summer and more cloudy by day than by night. June is the least cloudy month by night and by day, which is reflected in the sunshine totals.

FIGURE 8 Frequency of total cloud amount at Aberporth over the period 1957–76

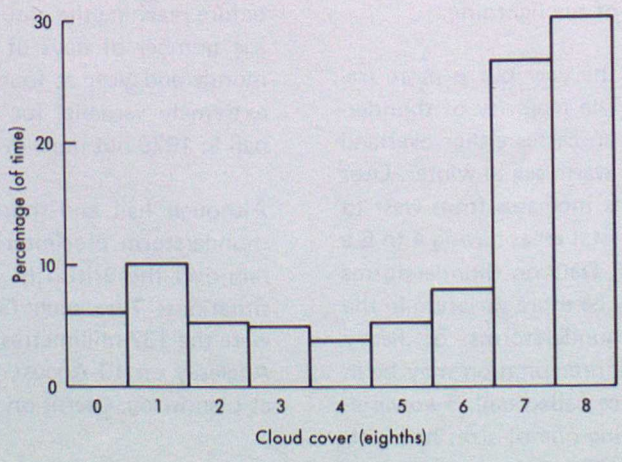


FIGURE 9 Percentage of time cloud amounts occurred in three cloud ranges at Valley during the period 1957–76

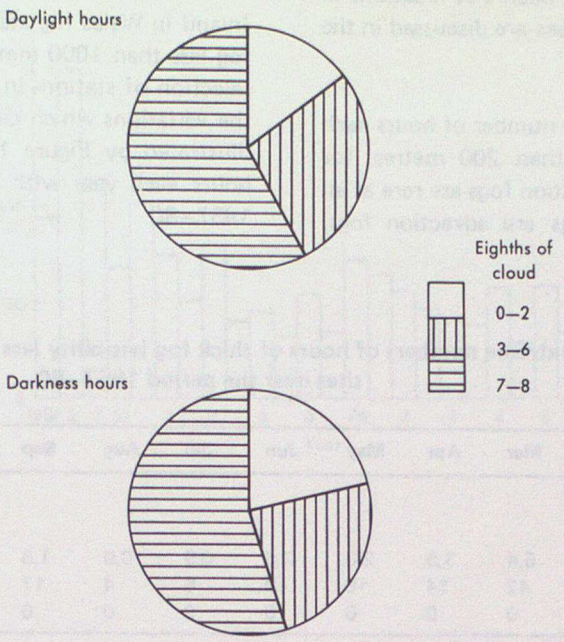


TABLE 7 Percentage frequency of hours with total cloud amount in selected ranges at Rhoose over the period 1957–76

Eighths	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	Daylight hours												
0–2	11.6	12.7	17.7	17.8	17.6	22.1	17.2	18.4	17.2	13.7	15.0	14.3	16.8
3–6	16.9	20.8	24.0	25.7	28.6	29.2	29.4	29.7	28.9	24.2	23.0	20.4	26.0
7–8	71.6	66.4	58.4	56.5	53.7	48.7	53.4	51.9	53.9	62.2	61.9	65.2	57.1
	Hours of darkness												
0–2	21.4	23.1	29.6	32.7	30.0	30.1	26.1	30.6	31.5	28.1	23.6	23.4	26.9
3–6	14.4	15.1	16.1	18.2	22.2	24.1	25.2	24.4	21.9	18.7	18.7	15.8	18.9
7–8	64.4	61.7	54.3	49.2	47.7	45.7	48.7	44.9	46.7	53.3	57.7	60.8	54.4

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, drizzle and snow, as well as 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 occasions when fog occurs at locations in Wales. Fog and fog formation processes are discussed in the Introduction to the series.

Table 8 gives the average and extreme number of hours each month of thick fog, visibility less than 200 metres, for Rhoose, Aberporth and Valley. Radiation fogs are rare at all three sites and the majority of fogs are advection fogs, normally in association with warm sectors, with upslope or hill fog as well at Aberporth.

Inland in Wales fog statistics are scarce and are restricted to fog less than 1000 metres at 0900 GMT. Data are given for a selection of stations in Table 9 and this gives an indication of the variations which can occur. The variability of fog is also illustrated by Figure 10 which gives the average number of hours each year with thick fog at Rhoose over the period 1957–80.

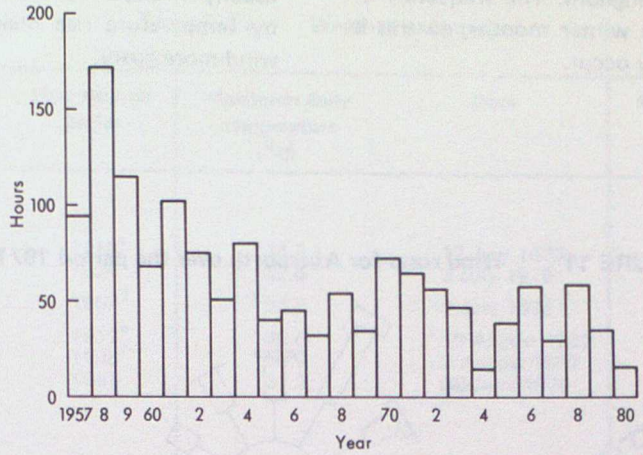
TABLE 8 **Average and extreme numbers of hours of thick fog (visibility less than 200 metres) at selected sites over the period 1957–80**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rhoose													
Average	10.6	8.6	6.4	3.5	2.0	2.6	0.9	0.9	1.5	7.1	5.7	11.1	60.8
Maximum	45	45	42	14	19	19	5	4	17	23	25	54	172
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	14
Aberporth													
Average	3.7	2.7	2.5	5.5	6.0	8.7	7.3	8.2	2.9	2.9	2.1	2.7	55.1
Maximum	26	15	12	17	41	54	26	34	11	21	17	24	151
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	15
Valley													
Average	1.4	0.4	1.0	2.4	0.7	1.2	0.8	1.9	2.2	1.7	0.3	0.5	14.5
Maximum	13	5	5	23	10	12	6	9	21	13	4	6	34
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 9 **Average number of days with fog at 0900 GMT at selected sites for the stated periods**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Hawarden Bridge (1961–80)	2.7	1.4	1.3	0.5	0.1	0.1	0.3	0.5	0.9	2.5	2.1	1.8	14.1
Ruthin (1961–80)	0.6	0.5	0.5	0.2	0.3	0.1	0.3	0.3	0.2	0.3	0.3	0.7	4.3
Loggerheads (1961–80)	2.2	3.1	2.1	1.6	0.9	0.7	0.8	0.9	1.3	2.2	1.9	1.5	19.3
Lake Vyrnwy (1961–80)	2.9	4.0	2.4	1.1	0.5	0.7	0.3	0.7	1.2	3.8	2.3	2.8	22.5
Gogerddan (1961–80)	0.3	0.5	0.1	0.3	0.1	0.3	0.3	0.3	0.3	0.2	0.3	0.5	3.7
Llwynon (1961–78)	4.8	4.8	3.6	1.8	1.3	1.1	1.2	1.6	2.6	4.2	3.4	5.0	35.2
Neath (1961–80)	0.9	0.6	0.5	0.5	0.3	0.3	0.1	0.1	0.3	0.3	0.4	0.5	4.7
Crumbland (1961–80)	6.9	6.4	4.6	3.4	1.5	1.2	0.9	1.9	3.1	6.8	5.1	6.3	48.3

FIGURE 10 Average annual number of hours of thick fog (visibility less than 200 metres) at Rhoose over the period 1957–80



WIND

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. Gales are most frequent around coasts and over exposed hills. At low altitudes in Wales gales occur most frequently in the extreme south-west of Dyfed with about 30 days of gale a year on average. Other coastal areas have 15 days or more of gale with the number of days decreasing inland at low altitudes to 5 days or fewer.

The wind speed usually increases with height so that high-altitude sites have more days of gale than low-altitude sites. There are no wind-recording stations at high altitudes in Wales so no data can be given; however, Snaefell at 615 metres on the Isle of Man averages over 200 days of gale a year.

Table 10 gives the annual percentage frequency of hourly mean wind speeds and directions for Port Talbot for the period 1970–78. This shows a high incidence of south-easterly winds which is due to its geographic position in relation to the high ground in South Wales.

The wind roses illustrate how the wind varies throughout the year at Aberporth. The high incidence of west-north-westerly winds is due to the weather types which predominate during that month, but the high incidence in July is due to the sea-breeze which most commonly blows from this direction. The geographic position of Aberporth makes southerly winds predominant over the year but over the country as a whole south-westerly winds predominate.

The wind direction is that from which the wind blows recorded either as a compass point or degrees from true north. Wind speeds are measured in knots (1 knot = 1.15 miles per hour, 1 metre per second = 1.94 knots) and are

TABLE 10 Annual percentage frequencies of hourly mean wind speed and direction for Port Talbot over the period 1970–78

Knots	Beaufort force equivalent	30° sectors centred on 360°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	All directions
Calm	0													10.5
1–3	1	0.2	0.1	0.2	0.3	1.5	1.0	0.4	0.7	1.0	1.1	1.1	1.3	9.0
4–10	2–3	1.9	1.2	2.1	3.7	7.0	2.9	1.9	2.5	3.6	4.3	4.0	5.3	40.5
11–21	4–5	0.9	0.4	0.9	3.5	5.3	1.6	0.9	1.5	4.6	6.4	5.3	3.8	35.0
22–33	6–7	+	+	+	0.2	0.3	0.1	+	0.1	0.5	1.0	0.9	0.5	3.9
≥34	≥8				+	+			+	+	+	+	+	0.1
Total ≥4		2.8	1.7	2.9	7.5	12.7	4.5	2.9	4.1	8.7	11.7	10.3	9.5	79.5

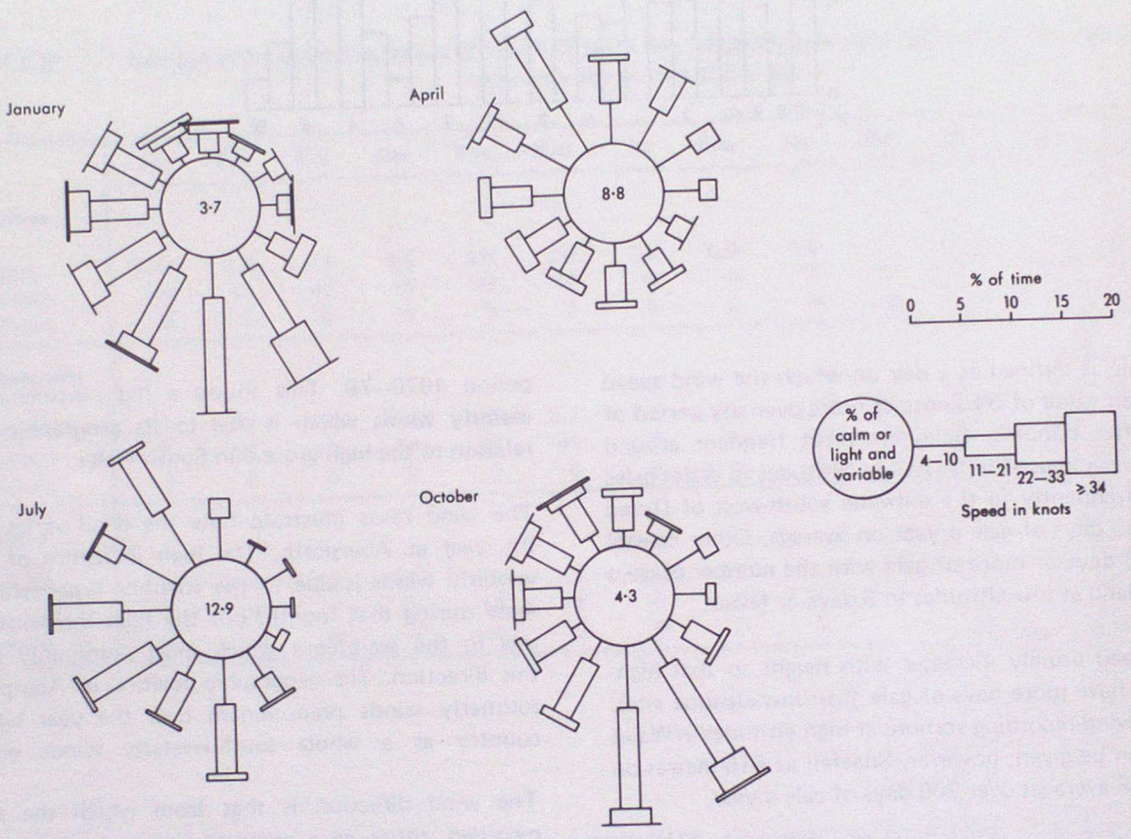
+ = Observations recorded in these categories but for less than 0.05 per cent of the time

Missing data 1.0

closely related to the pressure distribution. The strongest winds are associated with the passage of deep depressions across or close to the United Kingdom. The frequency of depressions is greatest during the winter months, so 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 due to increased turbulence caused by temperature rise making average speeds higher and the wind more gusty.

FIGURE 11 **Wind roses for Aberporth over the period 1971–80**



WEATHER EXTREMES

TABLE 11 Weather extremes

TEMPERATURE	Date records began	Maximum daily temperature (°C)	Date	Minimum daily temperature (°C)	Date
Wales					
Newport	1918[1]	33.9	12 July 1923	−15.6	26 January 1945
Usk	1924[2]	33.6	3 July 1976	−18.3	14 February 1929
Port Talbot	1952[3]	33.2	2 July 1976	−10.6	2 March 1954 13 January 1963
Rhayader	1917[4]	30.6	19 August 1932	−23.3	21 January 1940
Llandrindod Wells	1936[5]	30.6	3 August 1937	−21.7	21 January 1940
Corwen	1957	31.5	29 June 1976	−21.1	2 January 1962
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
Wales					
Dale Fort	1952	354.3	July 1955	24.8	December 1972
Milford Haven	1951[6]	352.8	July 1955	27.6	December 1956
Aberporth	1941	342.1	July 1955	25.1	December 1975
Rhoose	1955	323.4	June 1957	3.3	December 1956
Porthcawl	1950	306.4	June 1957	4.5	December 1956
Aber	1925	336.2	July 1955	4.9	December 1974
United Kingdom					
Eastbourne	–	383.9	July 1911		
London (Westminster)				0	December 1890

WIND	Date records began	Maximum mean wind speed (knots)	Date	Maximum gust speed (knots)	Date
Wales					
Aberporth	1970	62	13 December 1981	82	13 December 1981
Valley	1953	56	1 December 1966	82	2 January 1976
Milford Haven	1965	55	2 January 1976	78	2 January 1976
Rhoose	1961	44	9 October 1981	73	18 November 1963
United Kingdom (Low-level sites)					
South Gare (Cleveland)	–	70	2 January 1976		
Kirkwall (Orkney)	–			118	7 February 1969

RAINFALL	Date records began	Maximum daily fall (mm)	Date
Wales			
Rhondda (Lluest Wen Res)	1915[7]	211	11 November 1929
Blaenau Ffestiniog (Oakley Q)	1865[8]	197	28 June 1928
Blaenau Ffestiniog (Llechwedd Q)	1913[7]	197	28 June 1928
Snowdon (Llydaw Copper M)	1908[9]	184	28 June 1928
Trecastle (Blaenau-Hydfer)	1894	184	3 November 1931
United Kingdom			
Martinstown (Dorset)	–	279	18 July 1955

Records ceased:– 1 - 1977, 2 - 1980, 3 - 1979, 4 - 1956, 5 - 1975, 6 - 1962, 7 - 1971, 8 - 1970, 9 - 1967

TABLE 12 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 minima (21–09 GMT) and day maxima (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

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) 457703

London
284–286 High Holborn
London WC1V 7HX

01—430 5627

Manchester
Exchange Street
Stockport SK3 0ER

061—477 1017

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

Tyneside 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:

Aberdeen (Dyce) Airport
Aberdeen, Grampian AB2 0DU

Aberdeen (0224) 724986

Belfast (Aldergrove) Airport
Belfast
Northern Ireland BT29 4AB

Crumlin (084 94) 22804

Birmingham Airport
Birmingham B26 3QN

021—743 6240

Kirkwall Airport
Kirkwall
Orkney KW15 1TH

Kirkwall (0856) 3802

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

(0806) 242069

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

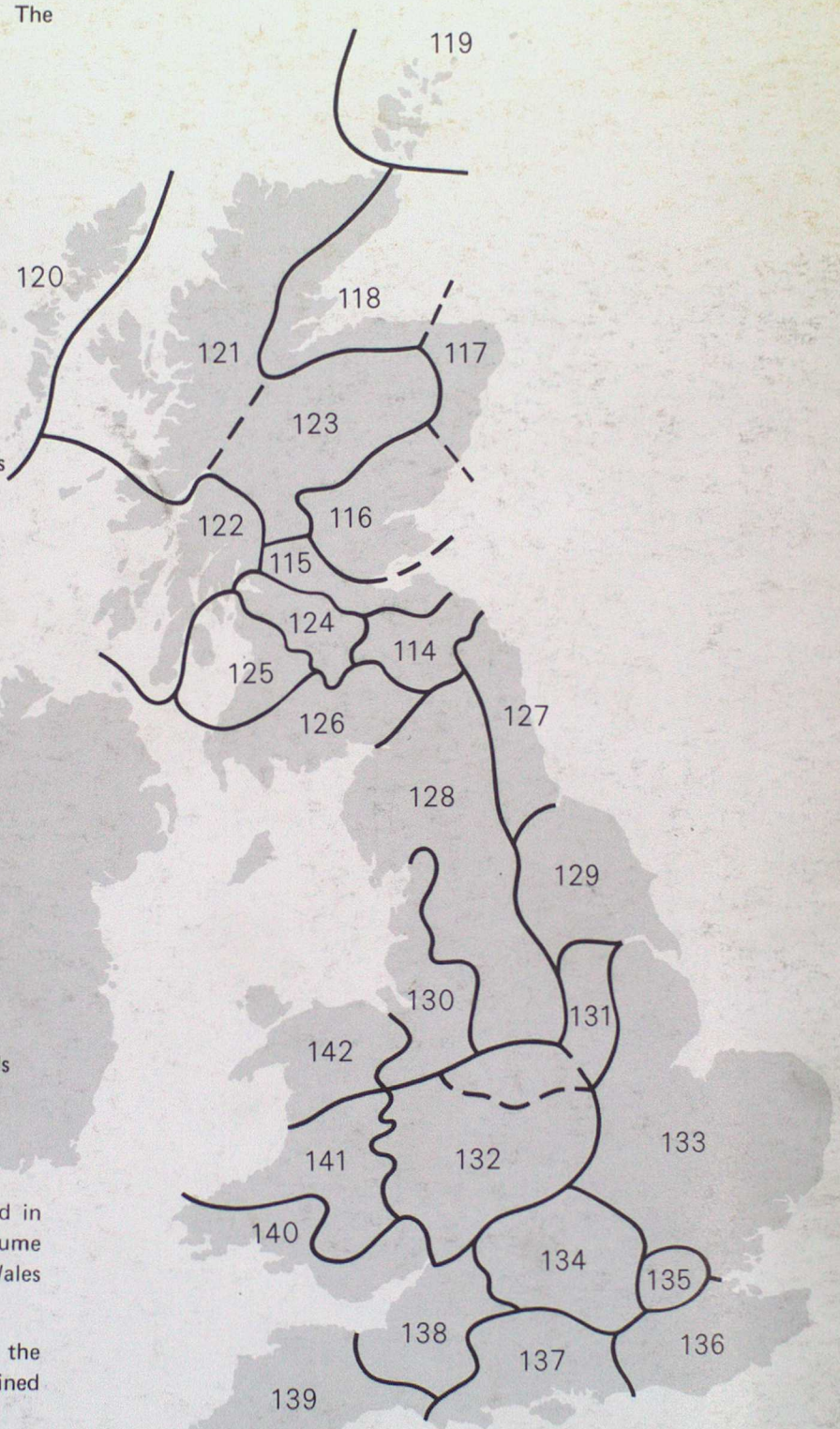
ENGLAND

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

} Now issued in one Volume No. 140 Wales



Further details of these memoranda and of the services mentioned on page 20 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 information on the climate of Northern Ireland please contact:

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