THE CLIMATE OF GREAT BRITAIN

E. YORKSHIRE and N. HUMBERSIDE

Climatological Memorandum 129

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The front cover shows a view of England and Wales from 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 clouds with the surface wind is clearly seen. East Yorkshire and north Humberside had around 9 hours of sunshine with some rain and hail showers mainly in the afternoon, with maximum temperatures about 12 ^{o}C.

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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 18.

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Advisory Services
February 1990

THE AREA

This memorandum describes the main features of the climate of east Yorkshire and north Humberside. The area lies between the Humber in the south and Teesside to the north and is bounded by the Pennines in the west and the North Sea in the east.

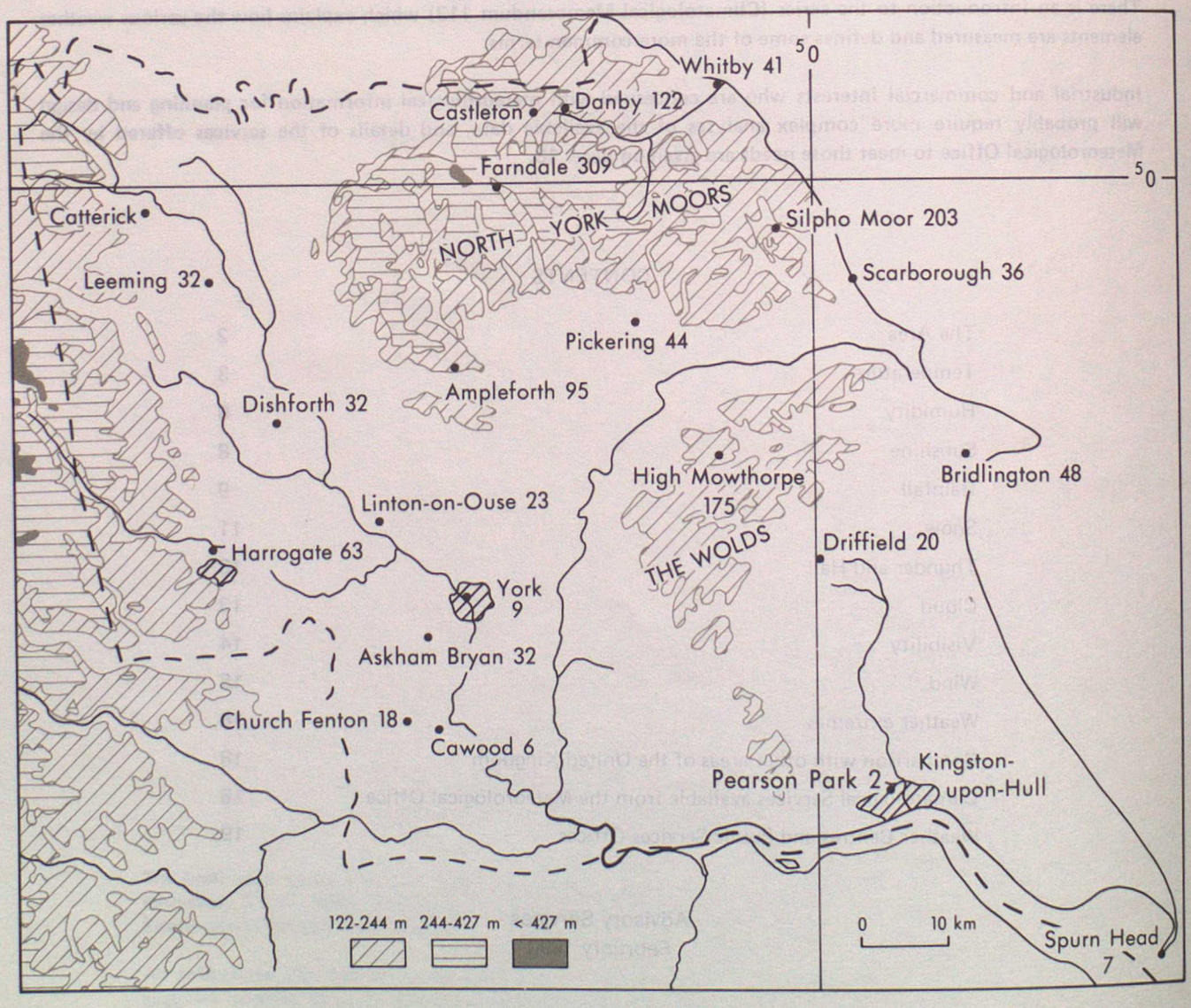
In the eastern half of the area, which contains much of the high ground, are a series of scarps and vales. The National Park of the North York Moors rises to 366 metres and is separated from the Wolds by the Vale of Pickering. To the south of the Wolds is Holderness which contains Kingson-upon-Hull. The western half of the area comprises mainly the Vale of York much of which is below 60 metres. This is an important farming area with cereals and mixed farming.

The River Humber has one of the largest estuaries on the east coast and sea-going vessels can reach as far as York. The Humber receives drainage from a large area which includes most of Yorkshire and the southern and eastern slopes of the Pennines. The main manufacturing industries are located along the banks of the Humber. Kingston-upon-Hull, which is the major regional centre for Humberside, developed during the Middle Ages and expanded with the iron and woollen industries of Yorkshire. It became a major fishing port because of the proximity of the fishing grounds in the North Sea but this has virtually ceased now. The fish which is processed there comes over land from other ports.

York, the other major city of the area, is situated on the River Ouse at the convergence of national routes. In Roman times it was their northern capital. Its industries include confectionery, chocolate, agricultural equipment and railway works. The national rail museum is at York. It is a major tourist centre and, with its cathedral, the next most important ecclesiastical centre to Canterbury.

The map below shows the topography of the area and the locations of the climatological and rainfall stations for which data are given in this memorandum. Data for Dishforth and Leeming are sequential and have been merged at times to give one set of data.

Topography of east Yorkshire and north Humberside and locations and altitudes (in metres) of the stations. Coordinates are National Grid references.



TEMPERATURE

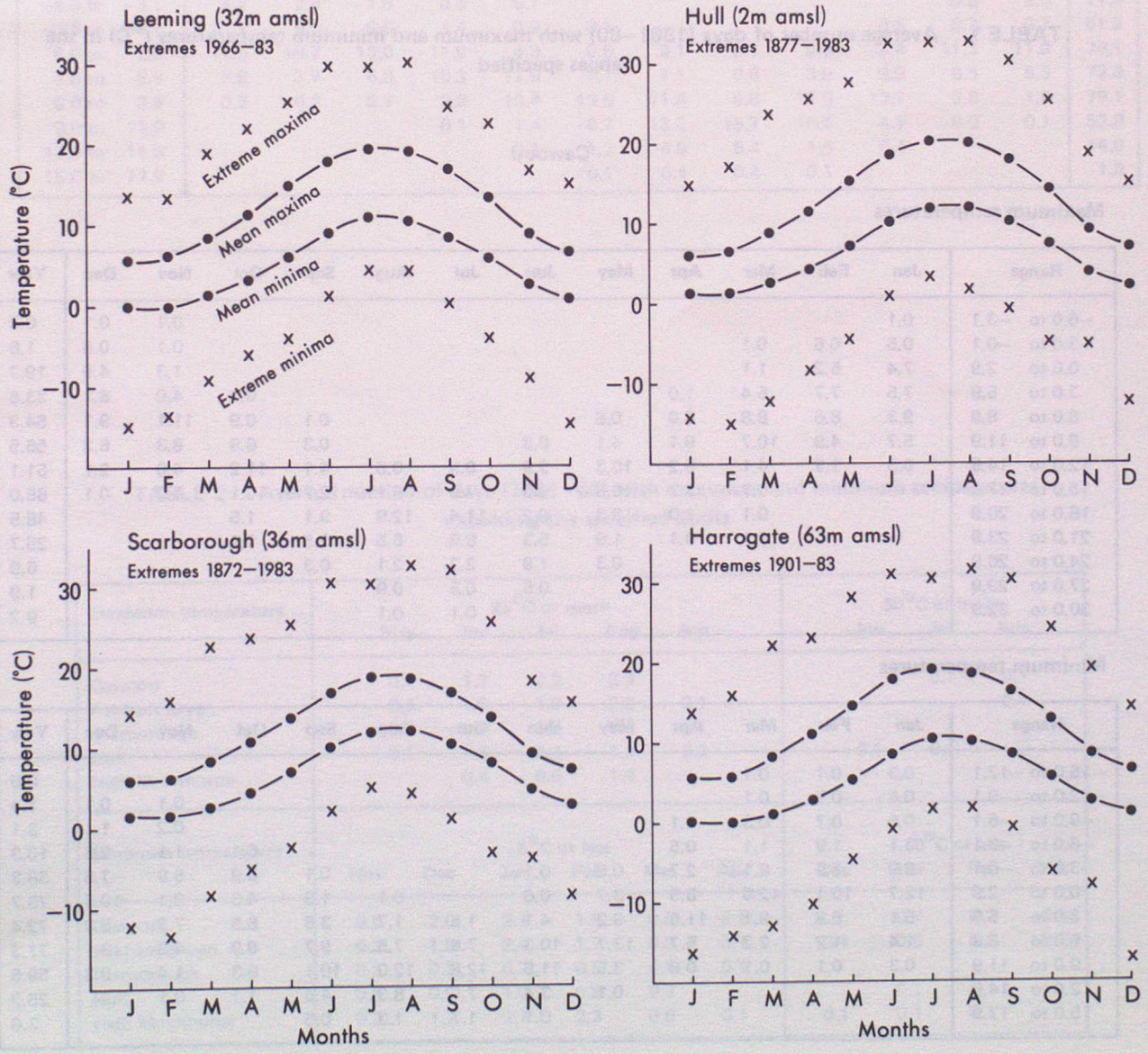
The mean annual temperature over east Yorkshire and north Humberside is around 9.5 °C at low altitudes with a decrease of about 0.5 °C for each 100 metre increase in altitude. Silpho Moor, for example, at 203 metres has a mean annual temperature of 8 °C. Over the British Isles mean annual temperatures at low altitudes range from about 7 °C in the Shetland Isles to over 11 °C in the extreme south-west of England and the Channel Islands.

Temperature shows both seasonal and diurnal variations. January is on average the coldest month with mean daily minimum temperatures varying from around 1.5 °C along the coast to near or just below zero inland. This compares with −1.0 °C in parts of Tayside and Grampian to over 5.5 °C in the Isles of Scilly. Minimum temperatures normally occur around sunrise and extreme minimum temperatures usually occur in December or January but have occurred in other months as well. Bridlington, for example, has an absolute minimim temperature of −13.9 °C which has been recorded in both January and April. The lowest known temperature in the area is −18.9 °C which has been recorded at both Castleton and Driffield.

Mean daily maximum temperatures are highest in July and are about 19 °C along the coast, 20 °C or a little above inland but only around 18 °C on the North York Moors. These compare with the highest values of 22.5 °C which occur in the London area and the lowest of around 15 °C in the Shetland Isles. Maximum temperatures normally occur 2 to 3 hours after midday and extreme temperatures usually occur in July or August though the highest known temperature recorded in the area was 34.3 °C at Whitby on 2 September 1906.

The variation of mean maximum and mean minimum temperatures together with the extreme temperatures recorded at four locations in east Yorkshire and north Humberside is shown in Figure 1. There is a marked similar-

FIGURE 1 Annual variation of maximum and minimum temperature over the period 1951–80 with extreme temperatures for the periods stated.



ity between the curves of mean values but more variation in the extremes which reflect the differing topographical features of the locations as well as the period over which the data have been recorded. The modifying influence of the sea means that Scarborough has higher average minimum temperatures in the winter, lower average maximum temperatures in the summer and less extreme minimum temperatures than the other three locations.

Table 1 gives the average number of days during 1961–80 that maximum and minimum temperatures occurred in the ranges specified at Cawood and Silpho Moor. The most striking feature of the table is the wide range of maximum and minimum temperatures which can occur at any time of the year. Cawood has more occasions of high and low temperatures than Silpho Moor due to its lower altitude and differing geographical location. The one high value at Silpho Moor in March was in 1965 when 21.7 °C was recorded on the 29th.

The average number of days a year of air frost in east Yorkshire and north Humberside varies from about 25 around the coasts to 60 to 75 inland. For ground frost the values are from 70 around the coasts to 120 or so at some inland sites. At the more sheltered inland locations a ground frost may occur at any time of the year though the summer months are usually free from air frosts. Figure 2 gives the average number of days of air and ground frost for four locations in the area over the period 1961–80. See also the Introduction to the series.

Table 2 gives the average number of days that temperatures exceeded certain limits in the area during the period 1961–80. Scarborough, on the coast, has less occasions of both high and low temperatures than the four inland locations because of the modifying influence of the sea. Variations in the inland sites are due to their differing topographical and geographical locations.

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

Cawood

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−6.0 to −3.1	0.1										0.1	0.1	0.3
−3.0 to −0.1	0.5	0.6	0.1								0.1	0.5	1.6
0.0 to 2.9	7.4	5.2	1.1								1.3	4.9	19.7
3.0 to 5.9	7.5	7.7	5.4	1.0						0.1	4.0	8.1	33.6
6.0 to 8.9	9.3	8.6	8.8	5.9	0.6				0.1	0.9	11.1	9.1	54.3
9.0 to 11.9	5.7	4.9	10.7	9.1	4.1	0.3			0.3	6.9	8.3	6.2	56.5
12.0 to 14.9	0.5	1.2	4.1	9.2	10.3	2.9	0.9	0.5	4.1	11.2	4.0	2.1	51.1
15.0 to 17.9			0.7	3.7	10.5	9.9	7.9	8.1	12.7	10.1	1.2	0.1	65.0
18.0 to 20.9			0.1	1.0	3.3	9.2	11.4	12.9	9.1	1.5			48.5
21.0 to 23.9			0.1	0.1	1.9	5.3	8.0	6.5	3.5	0.3			25.7
24.0 to 26.9					0.3	1.9	2.3	2.1	0.3				6.9
27.0 to 29.9						0.5	0.5	0.9					1.9
30.0 to 32.9							0.1	0.1					0.2

Minimum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−15.0 to −12.1	0.3	0.1	0.1										0.5
−12.0 to −9.1	0.5	0.5	0.1								0.1	0.1	1.4
−9.0 to −6.1	0.6	0.7	0.3	0.1							0.2	1.1	3.1
−6.0 to −3.1	3.1	1.9	1.1	0.5						0.1	1.1	2.6	10.3
−3.0 to −0.1	6.9	7.9	6.1	2.7	0.6	0.1			0.1	0.9	5.9	7.5	38.3
0.0 to 2.9	12.7	10.1	12.9	8.5	3.7	0.6		0.1	1.3	4.3	9.1	10.5	73.7
3.0 to 5.9	5.1	5.8	8.1	11.5	9.2	4.1	1.5	1.7	3.8	8.5	7.3	5.9	72.4
6.0 to 8.9	1.4	1.2	2.2	5.7	13.7	10.3	7.5	7.5	9.7	9.9	4.8	3.1	77.3
9.0 to 11.9	0.3	0.1	0.1	0.8	3.5	11.5	12.8	12.0	10.1	6.3	1.4	0.3	59.5
12.0 to 14.9					0.1	3.4	7.5	8.3	4.5	1.1	0.1		25.2
15.0 to 17.9						0.1	1.7	1.3	0.5				3.6

TABLE 1 continued

Silpho Moor

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−6.0 to −3.1	0.2	0.1											0.3
−3.0 to −0.1	0.5	1.3	0.1									0.3	2.2
0.0 to 2.9	7.8	5.8	3.5	0.5							1.5	4.5	23.6
3.0 to 5.9	11.0	10.3	8.2	4.4	0.1					0.1	5.7	11.8	51.7
6.0 to 8.9	8.2	7.5	8.7	8.7	3.5	0.1			0.1	3.3	13.1	9.1	62.1
9.0 to 11.9	3.3	2.9	7.8	8.4	8.5	2.1	0.5	0.2	2.4	10.9	7.1	4.9	58.9
12.0 to 14.9	0.1	0.4	2.0	5.5	9.5	5.9	5.1	5.1	9.6	11.1	2.6	0.5	57.5
15.0 to 17.9			0.6	2.0	6.7	10.8	11.6	13.5	11.3	4.9			61.5
18.0 to 20.9				0.5	1.8	7.8	8.9	8.1	5.3	0.5			33.0
21.0 to 23.9			0.1	0.1	0.8	2.5	4.1	3.1	1.1	0.2			12.1
24.0 to 26.9					0.1	0.5	0.7	0.9					2.2
27.0 to 30.9						0.1	0.1	0.1					0.2

Minimum temperatures

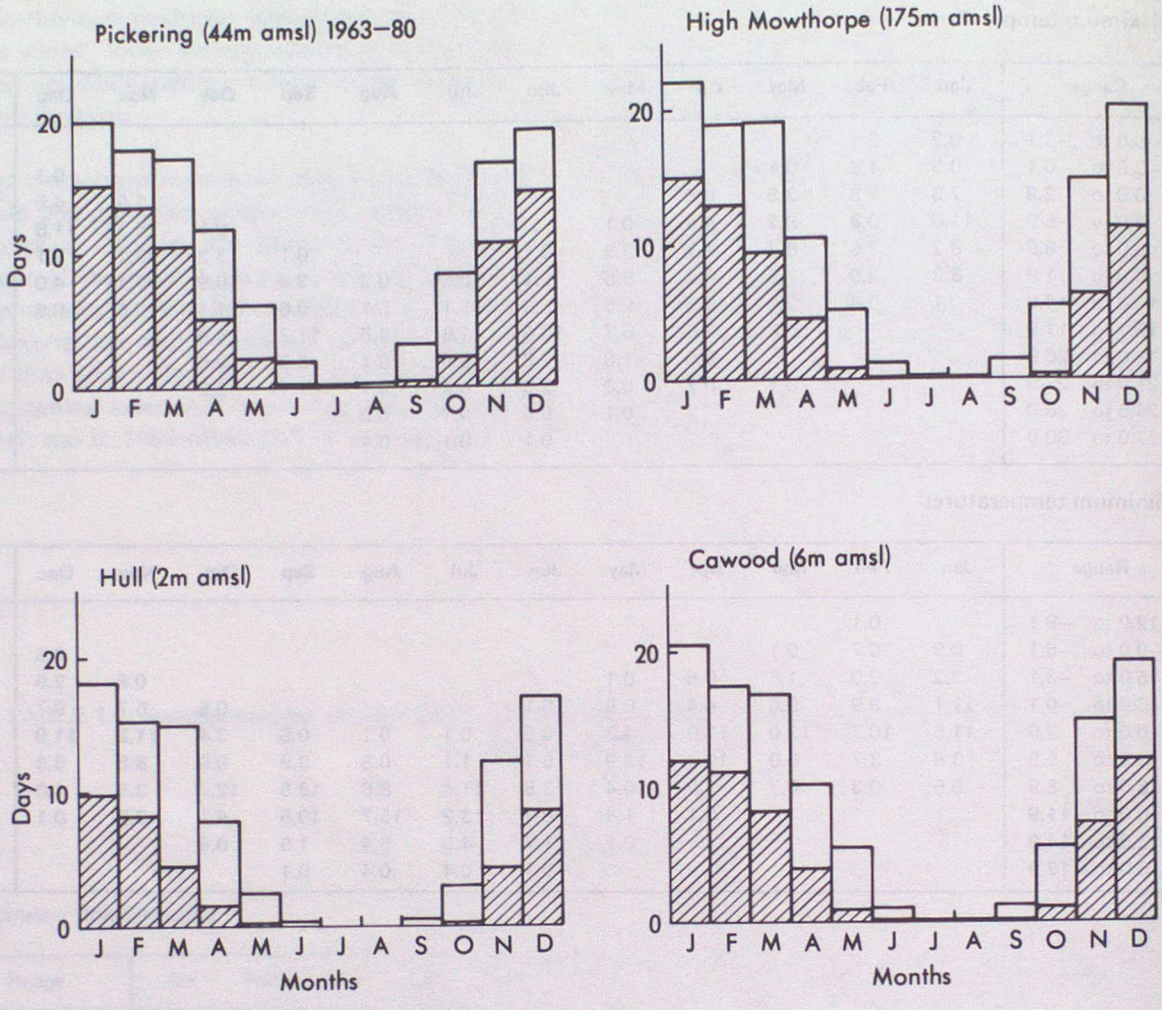
Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−12.0 to −9.1		0.1											0.1
−9.0 to −6.1	0.9	0.7	0.1									0.5	2.3
−6.0 to −3.1	3.2	2.9	1.6	0.5	0.1						0.8	2.5	11.5
−3.0 to −0.1	11.1	9.9	9.6	4.4	0.9	0.1				0.5	5.7	9.7	51.9
0.0 to 2.9	11.5	10.7	13.0	11.9	4.3	0.5	0.1	0.1	0.5	3.4	11.2	11.9	79.1
3.0 to 5.9	3.8	3.7	6.0	10.3	13.9	5.1	1.1	0.8	3.9	9.9	8.5	5.3	72.3
6.0 to 8.9	0.5	0.3	0.7	2.9	10.4	13.8	11.4	8.6	13.5	12.7	3.5	1.0	79.1
9.0 to 11.9				0.1	1.4	8.7	13.2	15.7	10.5	4.1	0.2	0.1	53.9
12.0 to 14.9					0.1	1.7	4.9	5.4	1.5	0.4			14.0
15.0 to 17.9						0.1	0.4	0.4	0.1				1.0

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

Maximum temperature	25°C or more					30°C or more		
	May	Jun	Jul	Aug	Sep	Jun	Jul	Aug
Cawood	0.1	1.3	2.2	2.3			0.1	0.1
Askham Bryan	0.1	1.8	1.9	2.3	0.1			0.1
Scarborough	0.1	0.3	0.4	0.5	0.1			
Hull	0.1	1.5	2.4	1.9	0.3	0.1	0.1	
High Mowthorpe		0.4	0.5	1.4				

Minimum temperature	−5°C or less						−10°C or less			
	Nov	Dec	Jan	Feb	Mar	Apr	Dec	Jan	Feb	Mar
Cawood	0.5	2.0	2.1	1.9	0.8	0.2		0.7	0.3	0.3
Askham Bryan	0.3	1.9	2.5	1.7	0.9	0.1	0.1	0.6	0.2	0.2
Scarborough	0.3	0.3	0.7	0.5	0.1	0.1				
Hull	0.1	0.9	1.0	0.9	0.3			0.1	0.1	
High Mowthorpe	0.3	1.7	2.7	2.3	0.9	0.1	0.1	0.1	0.1	

FIGURE 2 Average number of days with air frost (hatched areas) and ground frost (whole columns) 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).

In east Yorkshire and north Humberside the relative humidity 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. Relative humidity equals or exceeds 95 per cent for some 15 to 20 per cent of the time in the area, and 100 per cent can be reached in fog and persistent rain, snow or drizzle. Low relative humidities are less common as Figure 3 shows. This gives the percentage of time at Leeming that relative humidities occurred in the ranges specified over the period 1971–80. The 16–20 per cent range represents just 2 hours during the 10-year period.

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

FIGURE 3 Percentage of time relative humidity occurred in the ranges specified at Leeming over the period 1971–80.

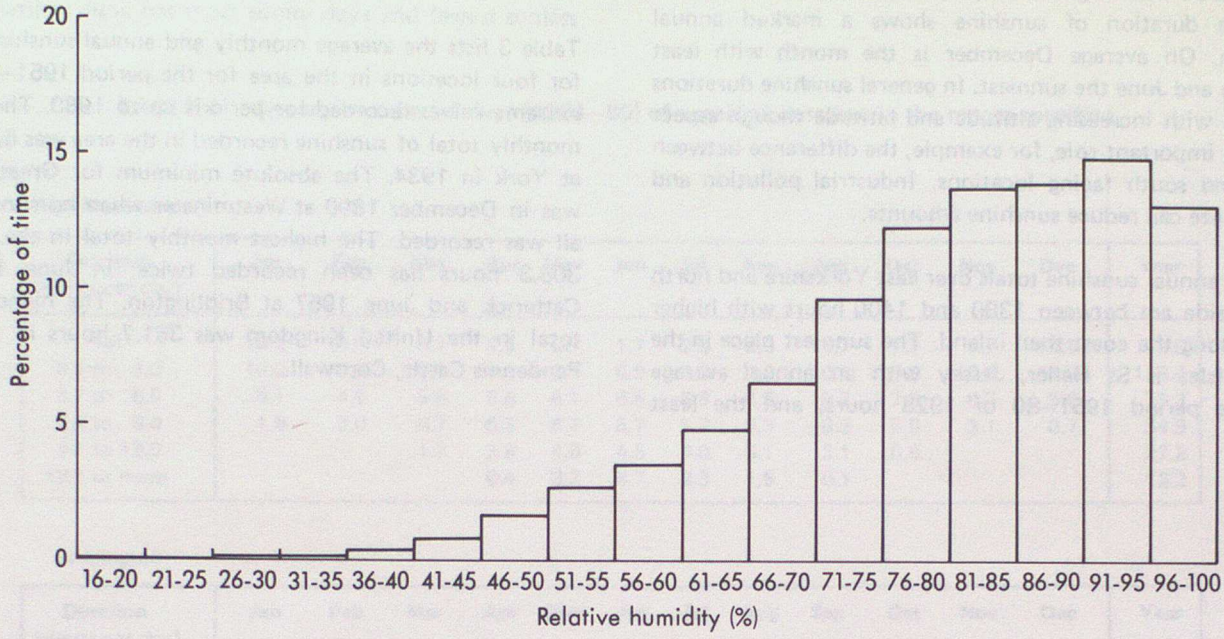
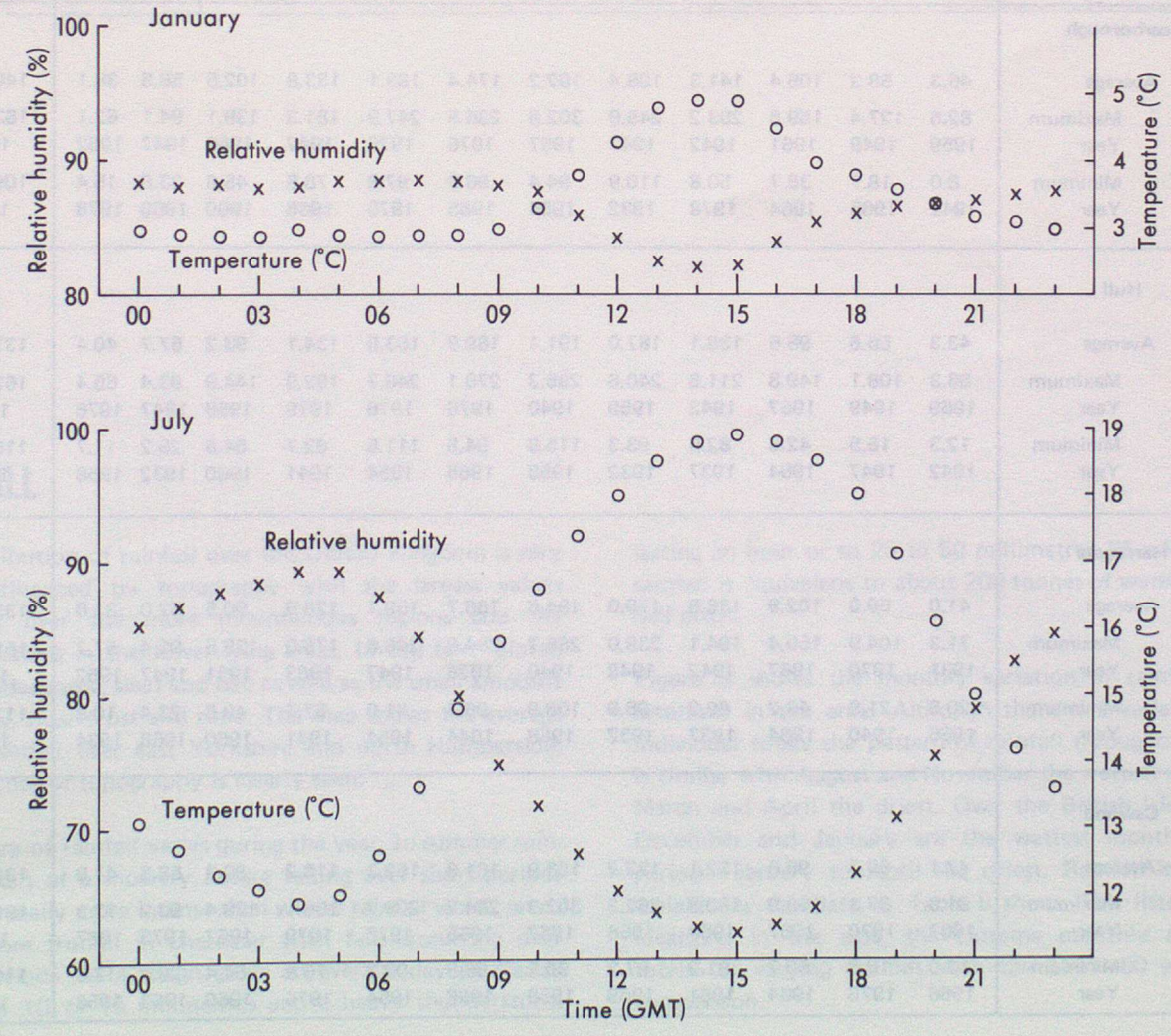


FIGURE 4 Average diurnal variation of temperature and relative humidity at Leeming for January and July over the period 1971–80.



SUNSHINE

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

Average annual sunshine totals over east Yorkshire and north Humberside are between 1300 and 1400 hours with higher values along the coast than inland. The sunniest place in the British Isles is St Helier, Jersey with an annual average over the period 1951–80 of 1928 hours, and the least sunniest the Shetland Isles with less than 1100 hours.

Table 3 lists the average monthly and annual sunshine totals for four locations in the area for the period 1951–80 plus extreme values recorded for periods up to 1980. The lowest monthly total of sunshine recorded in the area was 6.7 hours at York in 1934. The absolute minimum for Great Britain was in December 1890 at Westminster when no sunshine at all was recorded. The highest monthly total in the area of 308.3 hours has been recorded twice, in June 1940 at Catterick and June 1957 at Bridlington. The highest June total in the United Kingdom was 381.7 hours in 1925 at Pendennis Castle, Cornwall.

TABLE 3 Average monthly and annual totals of duration (hours) of bright sunshine over the period 1951–80 with extreme values for stated periods

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Scarborough														
	Average	46.3	58.3	105.4	141.3	188.4	192.2	174.4	163.1	133.8	102.5	58.5	38.1	1402.4
	Maximum	82.5	127.4	159.8	203.2	245.9	302.8	286.5	247.9	181.3	139.1	94.1	62.1	1639.1
1931	Year	1959	1949	1961	1942	1943	1957	1976	1976	1942	1956	1947	1962	1959
–80	Minimum	8.0	18.7	38.7	50.8	110.9	94.4	96.9	97.9	78.8	45.8	23.6	15.4	1095.8
	Year	1942	1965	1964	1978	1932	1954	1965	1978	1965	1960	1968	1978	1944
Hull														
	Average	43.3	56.5	98.6	138.1	187.0	191.1	169.9	163.8	134.1	98.2	57.7	40.4	1378.6
	Maximum	86.3	108.1	149.8	211.5	240.6	295.3	270.1	246.7	182.9	144.9	93.4	65.4	1638.6
1931	Year	1959	1949	1967	1942	1959	1940	1976	1976	1979	1959	1947	1976	1959
–80	Minimum	12.3	16.5	42.6	82.9	93.3	115.6	94.5	111.5	62.7	54.8	26.2	11.7	1168.6
	Year	1942	1947	1964	1937	1932	1958	1965	1954	1941	1960	1932	1956	1954
Harrogate														
	Average	41.0	59.0	102.9	138.6	179.0	184.6	166.7	159.1	125.9	90.5	52.0	31.0	1330.4
	Maximum	71.3	104.9	150.4	194.1	239.0	286.7	264.8	245.6	176.0	139.5	95.4	57.1	1555.8
1931	Year	1931	1970	1967	1942	1948	1940	1976	1947	1963	1931	1947	1952	1975
–80	Minimum	20.5	21.8	46.2	69.2	95.9	108.9	96.4	81.0	57.7	49.8	23.4	10.8	1116.1
	Year	1966	1940	1964	1937	1932	1958	1944	1954	1941	1960	1968	1934	1954
Cawood														
	Average	47.1	60.3	98.6	132.1	182.2	183.9	161.6	152.3	118.2	89.3	58.8	41.9	1326.3
	Maximum	91.8	97.3	163.9	180.3	262.3	302.3	264.2	229.7	156.1	128.4	90.2	72.3	1629.2
1951	Year	1967	1970	1967	1968	1956	1957	1955	1975	1979	1967	1973	1967	1955
–80	Minimum	13.0	16.5	50.7	81.9	97.2	96.1	86.8	92.3	76.8	54.4	28.4	17.6	1114.8
	Year	1966	1975	1964	1961	1969	1958	1968	1954	1976	1960	1953	1956	1958

Table 4 gives the average number of days each month during the period 1961–80 that sunshine durations in the ranges specified occurred at High Mowthorpe and Bridlington. For both locations June has most sunny days and fewest sunless days, and December has fewest sunny days. Bridlington has more sunny days throughout the year than High Mowthorpe due to its lower altitude and coastal location.

TABLE 4 Average number of days (1961–80) of sunshine duration in the ranges specified

High Mowthorpe

Duration (Hours per day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Nil	13.2	10.5	6.7	4.5	2.7	1.7	2.5	3.3	3.7	7.3	9.7	13.1	78.9
0.1 to 3.0	10.8	9.9	10.2	9.1	7.7	6.9	9.6	9.3	10.1	9.8	10.9	11.8	116.4
3.1 to 6.0	5.1	4.9	6.6	6.8	6.1	6.5	6.8	6.5	6.7	7.6	6.3	5.5	75.3
6.1 to 9.0	1.9	3.0	5.7	5.3	6.7	5.7	5.7	5.3	6.3	5.5	3.1	0.7	54.9
9.1 to 12.0			1.7	3.8	4.5	4.5	4.0	5.1	3.1	0.8			27.5
12.1 or more				0.4	3.2	4.7	2.3	1.5	0.1				12.2

Bridlington

Duration (Hours per day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Nil	12.9	11.2	6.3	4.7	2.4	1.5	2.6	2.9	3.0	7.8	9.5	12.9	78.1
0.1 to 3.0	10.0	8.3	8.7	8.1	7.3	6.8	9.2	8.2	9.4	8.7	10.2	10.9	105.8
3.1 to 6.0	5.8	4.9	7.1	6.8	6.5	6.1	6.1	7.1	6.8	7.2	6.1	6.0	76.3
6.1 to 9.0	2.3	3.7	6.7	5.4	5.3	5.2	5.9	5.4	6.7	6.4	4.2	1.3	58.3
9.1 to 12.0		0.1	2.2	4.1	5.2	4.8	4.1	4.8	4.0	0.9			30.1
12.1 or more				0.9	4.3	5.7	3.2	2.6	0.1				16.7

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 lower lying areas. In this text rainfall also includes snow, sleet and hail as well as the small amounts from dew, hoar frost and rime. The map shows the average annual rainfall over east Yorkshire and north Humberside; the influence of topography is clearly seen.

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.

Figure 5 shows the monthly variation of rainfall for six locations in the area. Although there is a variation in the individual totals the pattern of rainfall throughout the year is similar with August and November the wettest months and March and April the driest. Over the British Isles generally December and January are the wettest months and the period February to April the driest. Rainfall is extremely variable as the data in Table 5 show. This lists, for three locations in the area, the extreme monthly and annual totals for varying periods with the 1951–80 averages for comparison.

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

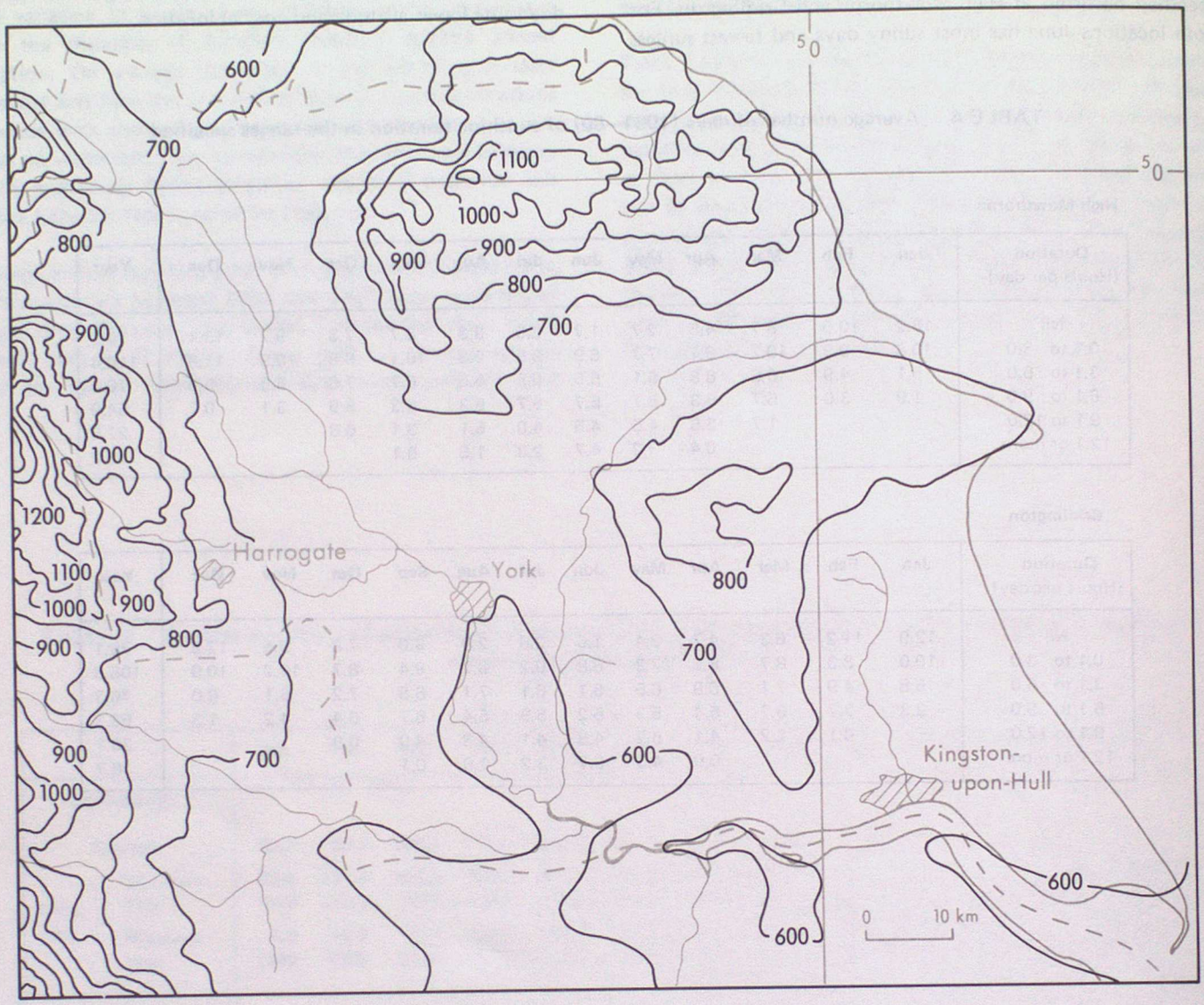


FIGURE 5 Average monthly rainfall over the period 1941–70.

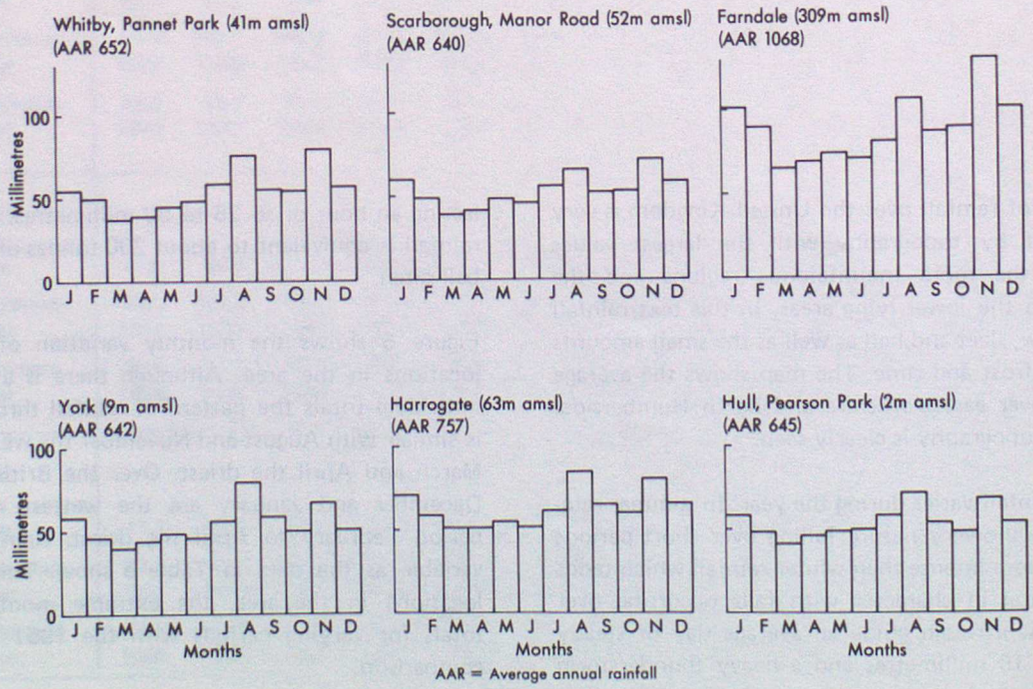


TABLE 5 Average annual and monthly rainfall (mm), maximum fall in 24 hours and extreme values over the period 1951–80

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Askham Bryan													
Average	56	44	40	40	53	48	57	69	58	52	59	56	632
Maximum fall in 24 hours	25.1	29.7	31.0	34.5	49.5	35.4	47.1	36.3	62.5	29.6	41.4	34.2	
Wettest	129.9	125.2	85.9	84.3	128.4	108.4	125.2	168.7	151.5	157.3	141.5	154.5	878.3
Driest	13.0	4.9	6.9	7.4	13.5	4.7	12.4	10.2	3.1	12.6	13.1	20.8	413.3
High Mowthorpe													
Average	70	59	54	44	57	53	66	79	61	66	79	75	763
Maximum fall in 24 hours	62.0	32.8	47.5	39.0	31.5	40.4	50.6	66.2	38.4	65.9	47.2	34.3	
Wettest	149.8	141.8	141.3	83.7	161.0	116.2	120.3	185.9	182.3	181.2	150.6	197.0	999.5
Driest	26.9	8.9	4.8	11.9	10.5	7.8	16.3	6.7	10.0	10.5	20.3	27.3	488.7
Silpho Moor													
Average	82	69	63	57	66	58	67	83	71	80	100	90	886
Maximum fall in 24 hours	44.5	42.7	44.2	42.7	67.1	42.7	55.7	57.4	97.1	46.4	45.0	54.5	
Wettest	155.1	173.4	144.4	149.1	180.6	115.6	128.7	186.2	281.4	281.8	195.8	228.4	1139.2
Driest	30.0	12.3	5.1	8.9	13.6	11.0	14.9	12.5	10.3	17.9	19.8	26.4	595.4

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 falls increases with increasing altitude and latitude. Falls of sleet or snow are normally confined to the months from November to May but a few falls occur in October, about once in ten years over the area. Snow also very rarely occurs in June and some wintry showers on 2 June 1975 were the first observed in the area in summer since 1888.

The average number of days each year when sleet or snow falls over east Yorkshire and north Humberside ranges from 15 along the coasts to more than 30 over the higher ground areas. Snowfall amounts are measured as the equivalent water content and included in the rainfall statistics. As a rough guide 10 centimetres of snow are equivalent to one centimetre of rainfall.

Snow rarely lies on low ground before November or after April and the average number of days with snow lying in the area varies from around 12 along coasts to about 25 over the higher ground. Days of snow lying are less than days of sleet or snow falling because in many cases when snow is falling the temperature of the air and the ground remain above freezing with the result that the snow never lies at all. Each 100 metre increase in altitude gives an approximate increase of 5 days a year in the number of occurrences of sleet or snow falling and snow lying.

Figure 6 shows the average number of days with sleet or snow falling and snow lying at four locations in the area. 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 in various depths at Dishforth/Leeming since the winter of 1946/47. This illustrates the great variability which occurs with the number of days with snow lying ranging from 69 in the winter of 1962/63 to one in the winter of 1974/75. 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.

FIGURE 6 Number of days with total snow depth at 0900 GMT in stated ranges at Leeming/Dishforth.

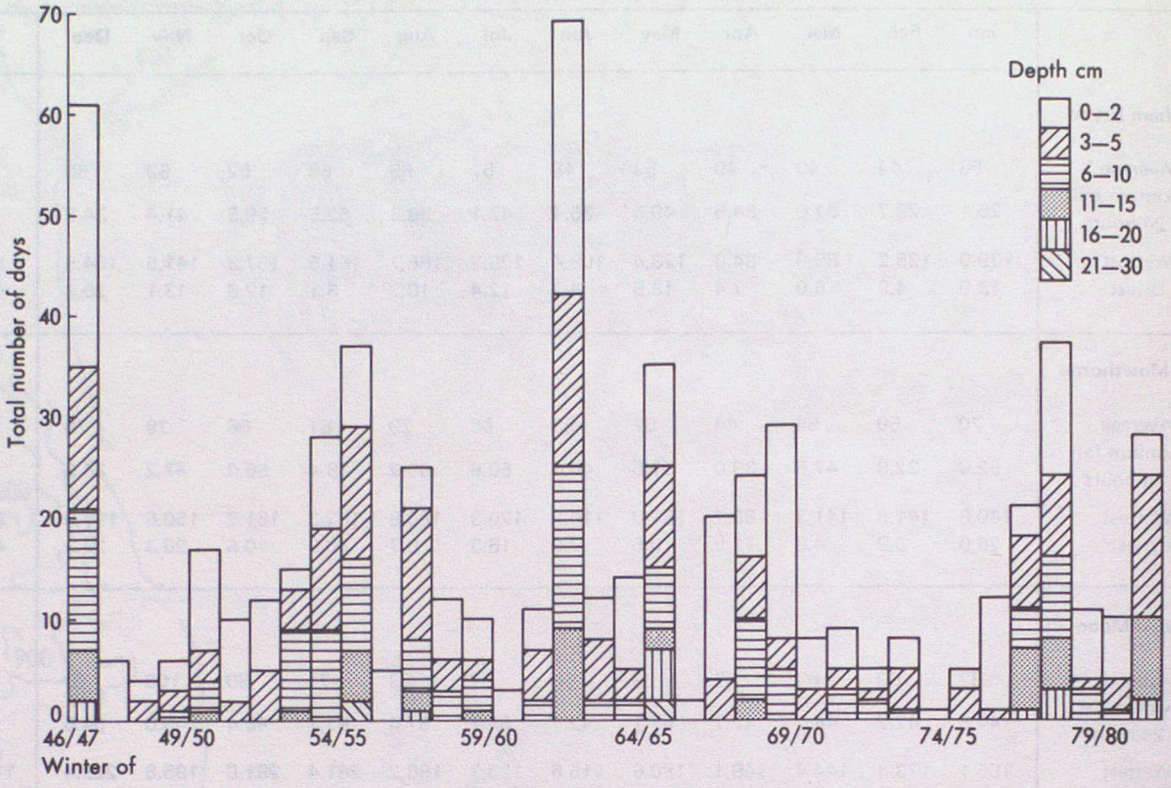
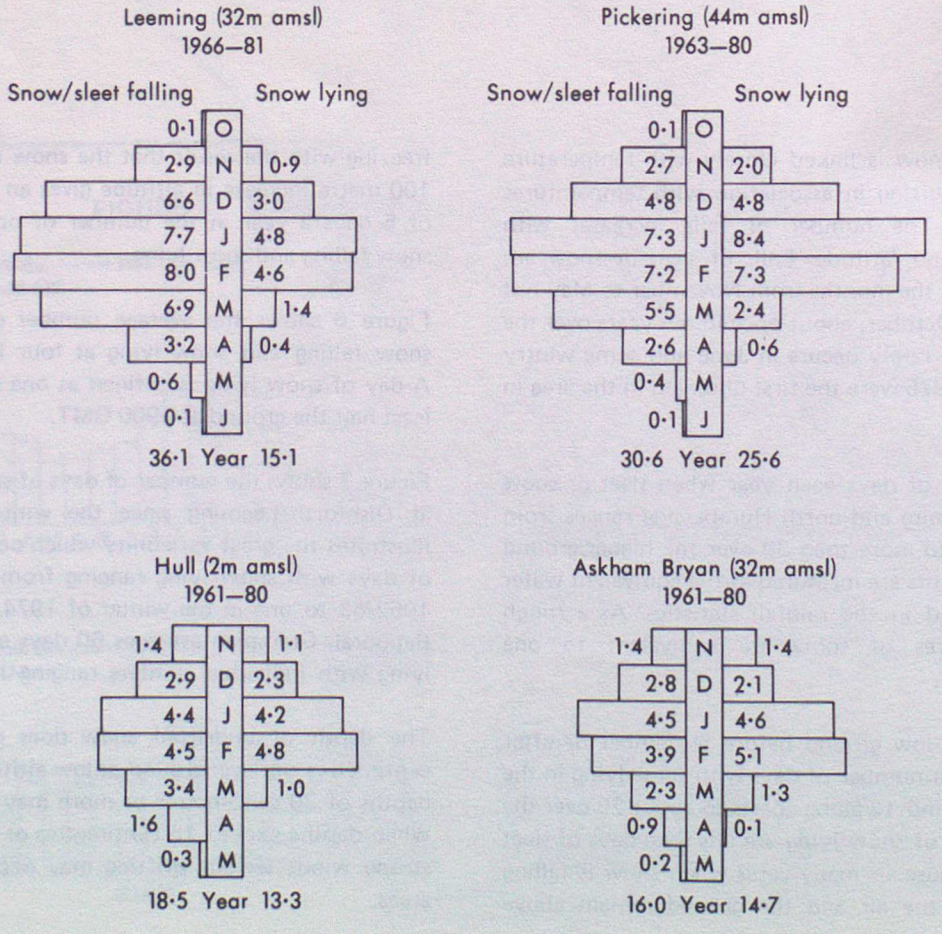


FIGURE 7 Average number of days per month with snow/sleet falling and snow lying at 0900 GMT over the periods stated.



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 the 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 southern part of the Vale of York has on average some 15 to 20 days of thunder a year but over much of east Yorkshire and north Humberside the average is around 5 to 10 days. There is great variability in individual years; for example, Leeming had 18 days with thunder in 1983 but only 3 in 1978. The majority of thunderstorms are triggered by convective processes either over land in summer or over a comparatively warm sea in winter.

In thunderstorms or heavy showers at any time of year the precipitation may be of hail or ice pellets. Both are in the form of hard, clear or opaque ice, the criterion between them being one of size. Hail has a diameter of 5 millimetres or more and ice pellets a diameter of less than 5 millimetres. Hail tends to have a maximum occurrence during the spring as it generally melts before reaching the ground in summer. Ice pellets are essentially a winter phenomenon occurring more frequently around coasts. Table 6 gives data on thunder, hail and ice pellets for a selection of locations in the area.

Although hail and thunder can occur simultaneously most thunderstorm precipitation is rain and the heaviest falls of rain are often associated with thundery situations. To give one example, on 2 July 1968 in a thunderstorm at Leeming 35.7 millimetres of rain fell in 8½ minutes.

TABLE 6 Average number of days of thunder, hail and ice pellets over the period 1961/6–82

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Thunder													
Askham Bryan	0.1	+	+	0.2	0.9	1.3	1.0	1.2	0.4	0.3	+	+	5.7
Cawood	0.1		0.1	0.1	1.3	1.0	1.2	1.3	0.7	0.3	+	+	6.0
Leeming	0.1		0.1	0.2	2.2	2.1	1.4	1.4	0.6	0.2	0.1	0.1	8.5
Hail													
Dishforth/Leeming	0.4	+	0.4	0.8	0.4	0.3	0.3	0.2		0.1	0.2	0.5	3.3
Ice Pellets													
Dishforth/Leeming	1.5	1.6	1.3	0.8	+	+			+	0.1	0.2	0.6	6.3

+ = Some occasions but less than 0.05

CLOUDS

Clouds are collections of very small water droplets, ice or a mixture or 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.

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

Table 7 gives the percentage frequency by month and year for the hours of daylight and darkness at Dishforth/Leeming over the period 1957–76. This is typical of the area being more cloudy in winter than in summer and more cloudy by day than by night.

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

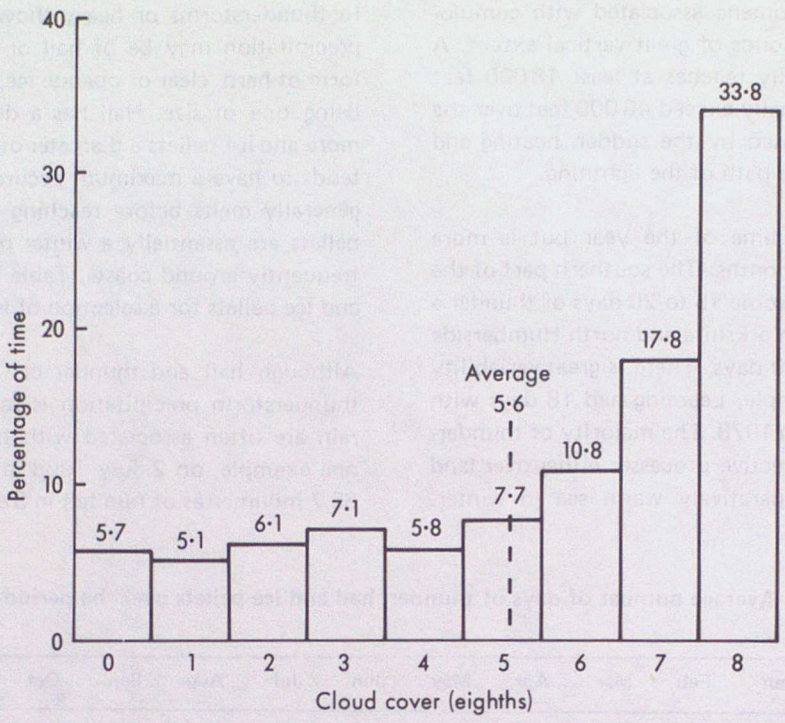


TABLE 7 Percentage frequency of hours with total cloud amount in selected ranges at Dishforth/Leeming over the period 1957–76

Eighths	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	Daylight hours												
0–2	14.0	12.2	12.2	11.3	11.5	16.1	10.6	11.6	11.6	12.8	15.4	16.1	12.8
3–6	19.7	19.5	21.9	23.5	26.5	25.5	24.4	25.9	25.5	21.6	20.8	20.1	13.5
7–8	66.3	68.2	66.0	65.1	61.8	58.3	64.8	62.4	62.9	65.7	63.8	63.8	63.8
	Hours of darkness												
0–2	23.0	22.7	26.0	26.2	24.9	25.4	20.9	27.0	26.3	24.2	26.1	22.8	24.5
3–6	15.5	15.2	15.3	17.0	23.2	22.6	23.3	21.5	18.8	17.3	15.8	17.5	17.9
7–8	61.7	62.0	58.6	56.7	51.9	52.1	55.9	51.6	54.9	58.5	58.0	59.8	57.6

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 during the early morning though it may 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 east Yorkshire and north Humberside. Fog and fog formation processes are discussed in the Introduction to the series.

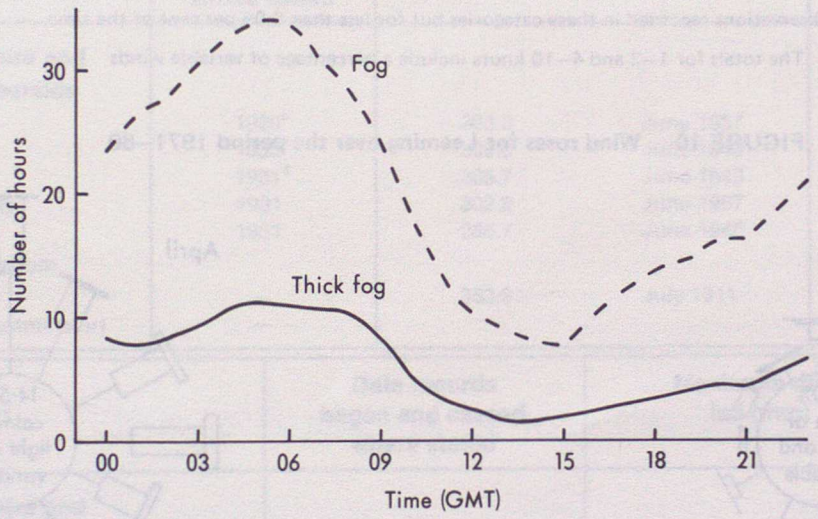
Further indication of the variability of fog can be seen in Table 8 which gives the average number of days of fog, visibility less than 1000 metres, at 0900 GMT for three locations in the area.

Figure 9 shows the diurnal variation of fog and thick fog at Leeming over the period 1971–80; this illustrates some of the points made. The occurrence of fog is extremely variable, for example, the average number of hours a year of thick fog at Leeming during 1971–80 was 148.4 but annual totals ranged from 79 to 249 hours.

TABLE 8 Average number of days of fog, visibility less than 1000 metres, at 0900 GMT over the period 1966/71–81

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Silpho Moor	2.3	3.4	2.1	2.4	1.9	1.4	1.4	1.5	1.3	3.0	1.5	2.8	24.8
High Mowthorpe	4.8	5.8	2.5	1.8	1.5	0.5	0.7	0.8	0.7	3.3	2.3	4.4	29.2
Leeming	4.7	2.9	1.5	1.1	0.5	0.3		0.8	0.9	3.3	3.3	3.3	22.6

FIGURE 9 Average annual number of hours of fog, visibility less than 1000 metres, and thick fog, visibility less than 200 metres, at Leeming over the period 1971–80.



WIND

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 mph, 1 metre per second = 1.94 knots) and are closely related to the pressure distribution. The strongest winds are associated with the passage of 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.

A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of ten consecutive minutes. In east Yorkshire and north Humberside gales are most frequent along the coastal section with on average 10 days of gale a year. Away from the coast the number decreases steadily with most inland areas only having on average 2 days of gale a year. As a comparison the Shetland Isles have on average 50 days of gale a year.

Table 9 gives the annual percentage frequency of hourly mean wind speeds and directions for Linton-on-Ouse for the period 1975–80. These data are representative of the area with the south-westerly winds predominating. Around the coasts the total percentages for the wind directions will be similar but the wind speeds will be higher.

The wind roses for Leeming illustrate how the wind varies throughout the year. The high incidence of north to north-easterly winds in April is due to the weather patterns which predominate during this month. The high incidence of south-easterly winds at Leeming in January and October (and at other times of the year) is due to the tendency for winds to be funnelled through the Vale of York. This effect can even occur with light winds coming from a south-westerly direction.

The strongest winds recorded in the area are an hourly mean speed of 51 knots and a maximum gust of 82 knots both at Spurn Head (see extremes on page 17).

TABLE 9 Annual percentage frequencies of hourly mean wind speed and direction for Linton-on-Ouse over the period 1975–80

Knots	Beaufort force equivalent	30° sectors centred on 360°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	All directions
Calm	0													0.8
1–3	1	0.6	0.4	0.9	2.5	2.4	1.8	1.3	1.1	1.0	0.8	1.4	1.4	19.9
4–10	2–3	2.4	2.1	2.4	3.1	4.3	6.6	5.1	4.4	5.1	3.8	3.6	5.8	49.9
11–21	4–5	1.7	1.4	1.5	1.0	0.6	1.3	1.4	2.7	5.2	4.5	1.6	3.0	26.4
22–33	6–7	0.1	+	0.1	+	+	+	+	0.1	0.6	0.4	0.1	0.1	1.5
≥34	≥8									+	+	+		0.1
Total ≥4		4.3	3.6	4.0	4.1	5.0	7.9	6.5	7.3	10.9	8.7	5.4	9.0	77.8

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

The totals for 1–3 and 4–10 knots include a percentage of variable winds

FIGURE 10 Wind roses for Leeming over the period 1971–80

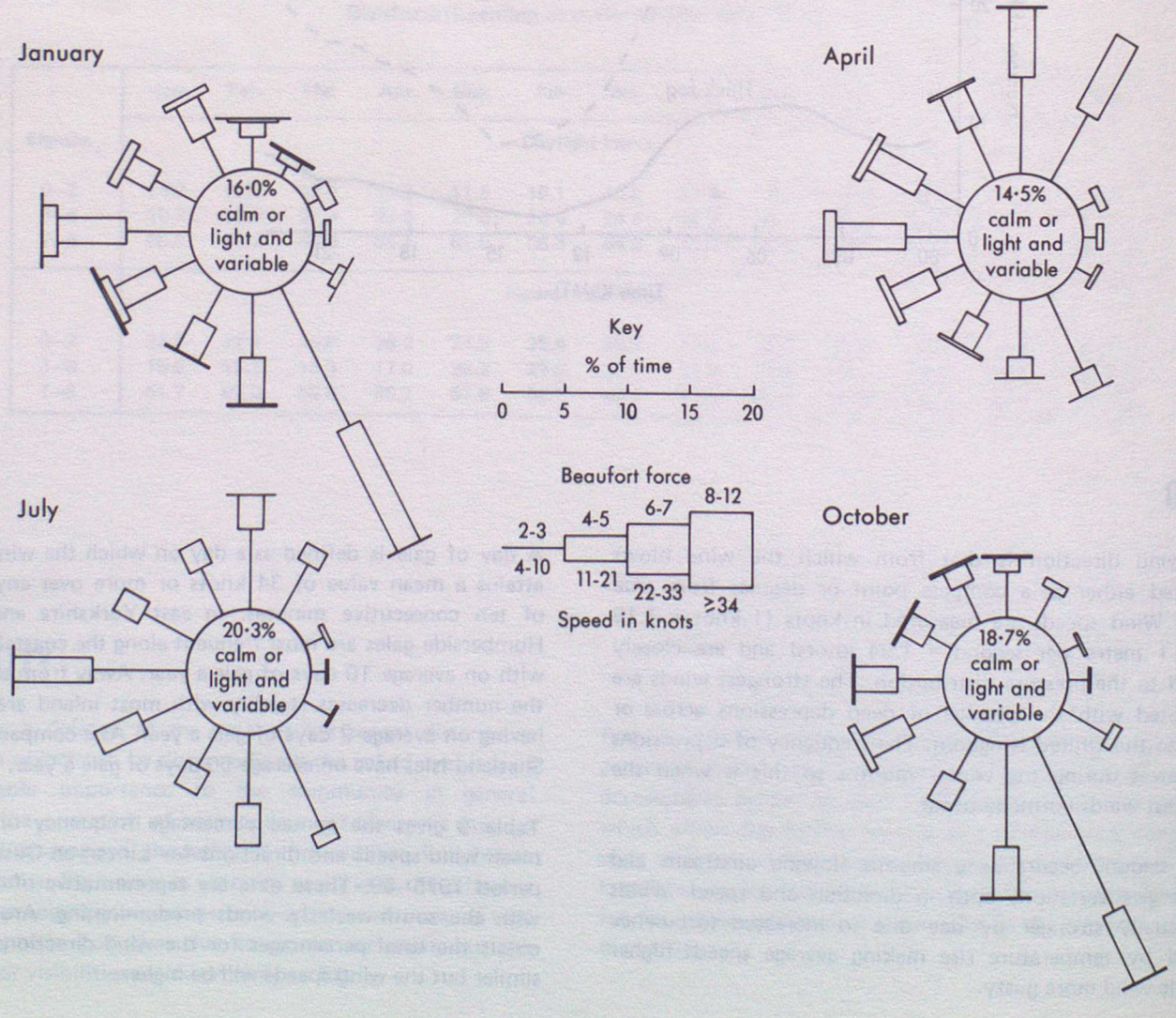


TABLE 10 Weather extremes

TEMPERATURE	Date records began and ceased where stated	Maximum daily temperature (°C)	Date	Minimum daily temperature (°C)	Date
East Yorkshire and north Humberside					
Whitby	1903[1]	34.3	2 September 1906	−12.8	4 March 1947
Cawood	1952	33.3	12 August 1953	−14.8	12 December 1981
Dishforth	1951[2]	33.3	12 August 1953	−14.4	24 January 1958
York	1901[3]	33.3	1 September 1906 12 August 1953	−13.9	21 January 1940
Castleton	1928[4]	31.1	22 June 1941 12 July 1949	−18.9	21 January 1940
Driffield	1942[5]	31.7	12 August 1953	−18.9	21 January 1958
United Kingdom					
Raunds					
Epsom	—	36.7	9 August 1911		
Canterbury					
Braemar	—			−27.2	11 February 1895 10 January 1982

SUNSHINE	Date records began and ceased where stated	Maximum monthly duration (hours)	Date	Minimum monthly duration (hours)	Date
East Yorkshire and north Humberside					
Bridlington	1920[6]	308.3	June 1957	8.5	January 1942
Catterick	1933[7]	308.3	June 1940	12.8	December 1944
York	1931[8]	305.7	June 1940	6.7	December 1934
Scarborough	1931	302.8	June 1957	8.0	January 1942
Harrogate	1931	286.7	June 1940	10.8	December 1934
United Kingdom					
Eastbourne	—	383.9	July 1911		
London (Westminster)	—			0	December 1890

RAINFALL	Date records began and ceased where stated	Maximum daily fall (mm)	Date
East Yorkshire and north Humberside			
Castleton	—	145	22 July 1930
Danby (School House)	—	132	22 July 1930
Danby Lodge	1907[9]	132	22 July 1930
Castleton	—	127	4 September 1931
United Kingdom			
Martinstown (Dorset)	—	279	18 July 1955

WIND	Date records began and ceased where stated	Hourly mean wind speed (knots)	Date	Gust speed (knots)	Date
East Yorkshire and north Humberside					
Spurn Head	1922[10] 1978	51	6 January 1928	82	11 January 1978
Leeming	1966	45	18 December 1966 17 March 1967	68	2 January 1976
Church Fenton	1967	44	15 January 1968	68	15 January 1978
Catterick	1933[11]	43	9 January 1936	76	9 January 1936
United Kingdom					
(Low-level sites)					
Shoreham-by-Sea (East Sussex)	—	72	16 October 1987		
Fraserburgh (Grampian Region)	—			123	13 February 1989

Records ceased: [1], 1978; [2], 1965; [3], 1978; [4], 1951; [5], 1958; [6], 1979; [7], 1944; [8], 1964; [9], 1961; [10], 1958; [11], 1942

TABLE 11 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.

[x] For Regents Park.

[†] For Braemar.

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

CLIMATOLOGICAL SERVICES AVAILABLE FROM THE METEOROLOGICAL OFFICE

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

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

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

Enquiries related to aspects of past weather data should be directed to the appropriate address given on page 20 or, if more convenient, initially to your local weather centre (see page 19). 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 Chief Executive
Meteorological Office (Met O 7)
London Road
Bracknell
Berkshire RG12 2SZ

or from your local weather centre.

WEATHER CENTRES AND PUBLIC SERVICE OFFICES

Weather Centres

Aberdeen
Seaforth Centre
Ltime Street
Aberdeen AB2 1BJ

Aberdeen (0224) 210571

Bristol
The Gaunts House
Denmark Street
Bristol BS1 5DH

Bristol (0272) 279272

Cardiff
Southgate House
Wood Street
Cardiff CF1 1EW

Cardiff (0222) 390420

Glasgow
33 Bothwell Street
Glasgow G2 6TS

041—248 7272

Leeds
Oak House
Park Lane
Leeds LS3 1EL

Leeds (0532) 457753

London
284–286 High Holborn
London WC1V 7HX

071—430 5627

Manchester
Applicon House
Exchange Street
Stockport SK3 0ER

061—477 1017

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

091—232 3808

Norwich
Rouen House
Rouen Road
Norwich NR1 1RB

Norwich (0603) 630164

Nottingham
Main Road
Watnall
Nottingham NG16 1HT

Nottingham (0602) 384094

Plymouth
Royal Air Force Mount Batten
Plymouth
Devon PL9 9SH

Plymouth (0752) 493377

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

Southampton (0703) 220646

Public Service Offices

Meteorological offices at:

Belfast International Airport
Belfast
Northern Ireland BT29 4AB

Crumlin (084 94) 22804

Birmingham Airport
Birmingham B26 3QN

021—782 6240

Kirkwall Airport
Kirkwall
Orkney KW15 1TH

Kirkwall (0856) 3802

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

Sullom Voe (0806) 242060

THE CLIMATE OF GREAT BRITAIN

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

SCOTLAND

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

ENGLAND

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

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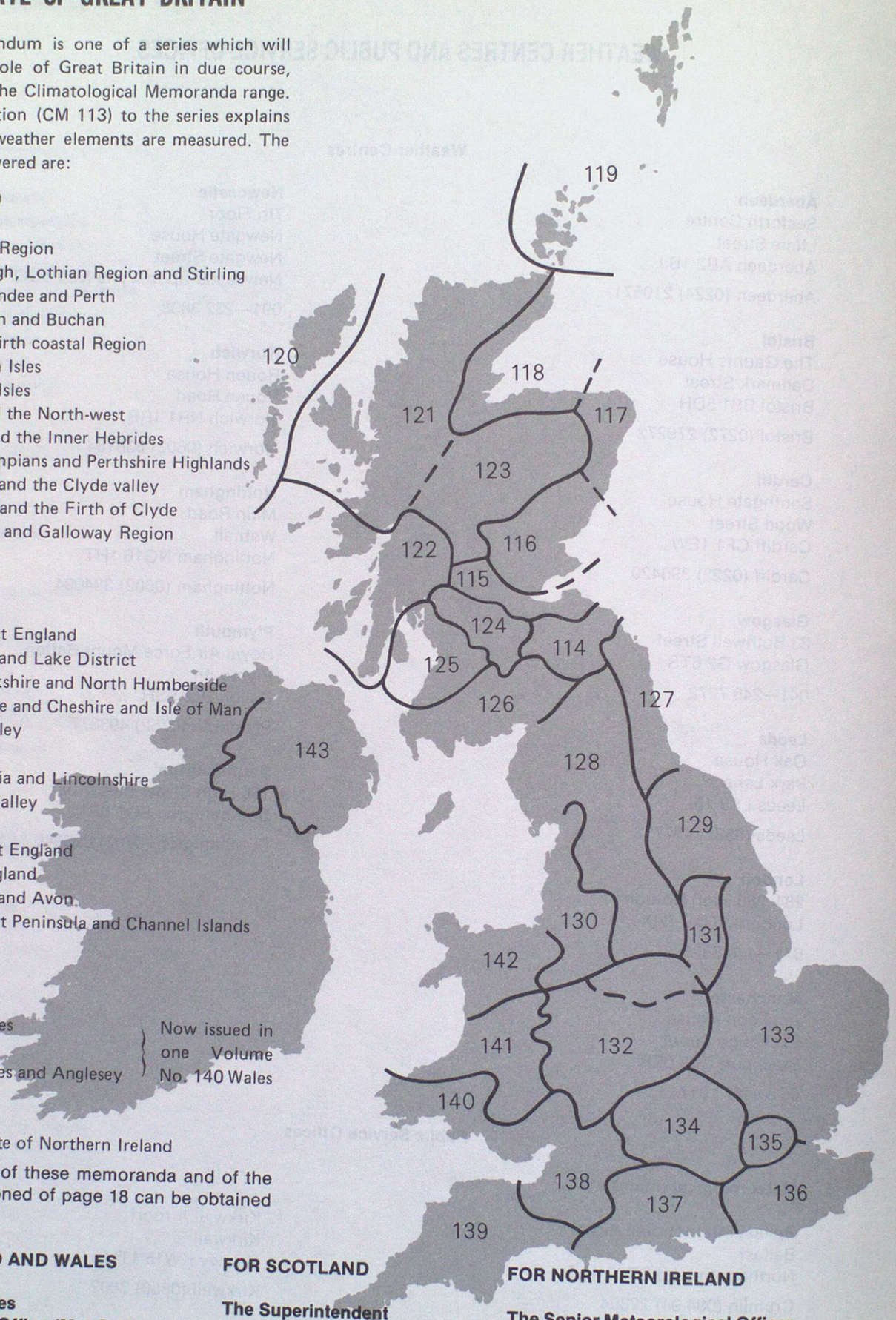

Further details of these memoranda and of the services mentioned of page 18 can be obtained from:

FOR ENGLAND AND WALES

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

FOR SCOTLAND

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

FOR NORTHERN IRELAND

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

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