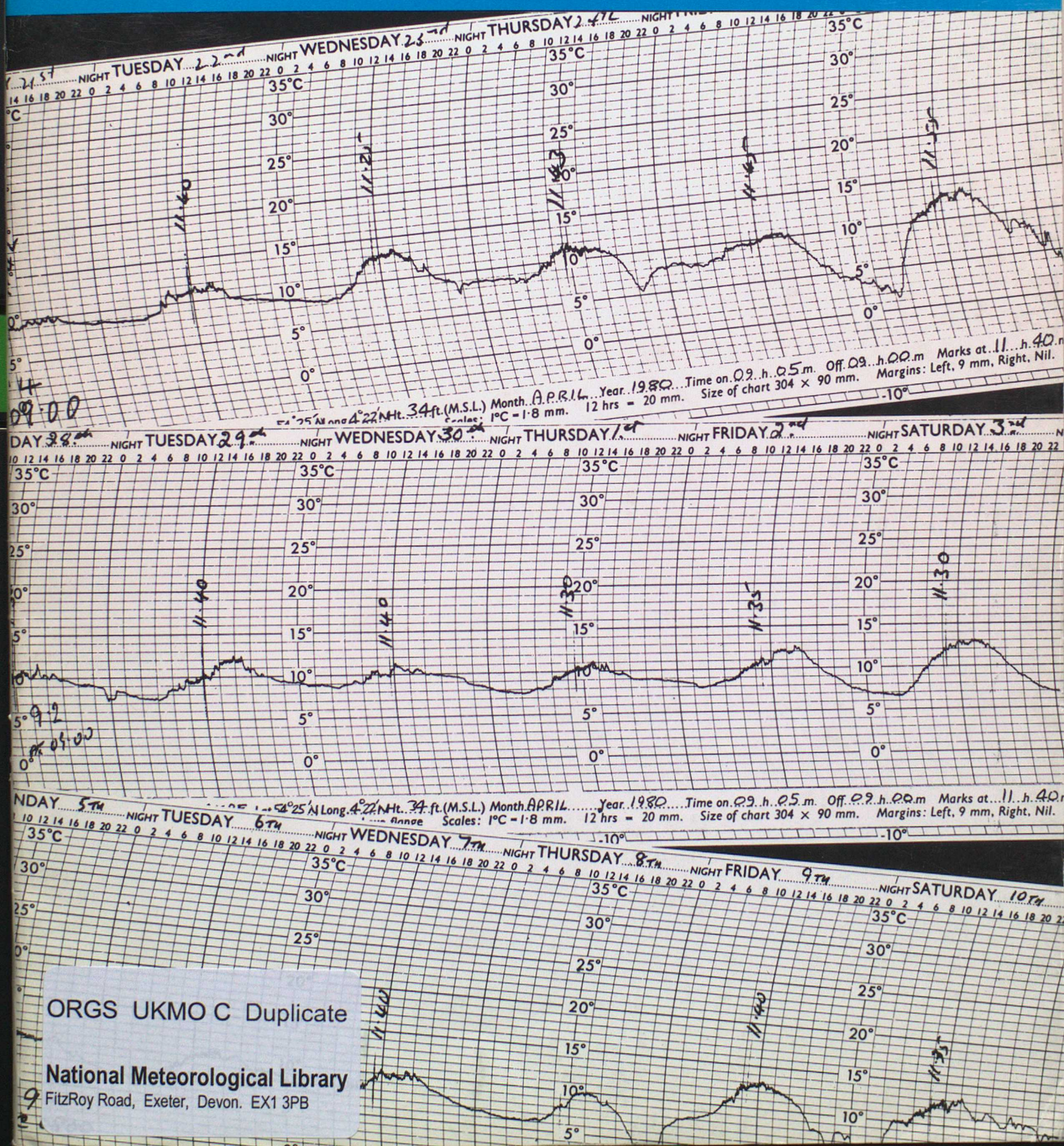




Climatological Memorandum No. 111

Rates of change of air temperature in the United Kingdom in time-scales of between 1 and 6 hours



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RATES OF CHANGE OF AIR TEMPERATURE IN THE UNITED KINGDOM IN TIME-SCALES OF BETWEEN 1 AND 6 HOURS



Introduction

This Climatological Memorandum was prepared to provide information on temperature rate changes as they occur between 1 and 6 hours in the United Kingdom.

Data stations for which hourly values of air temperature are available since the 15 years 1961-75 were selected to give a broad coverage of the country. London Gatwick Airport, Manchester Airport, Birmingham, Cardiff, Leeds, Luton, Newcastle, Norwich, Oxford, Plymouth, Southampton, and the Isle of Man. Data for Birmingham for 1961-75 were also available.

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Tables

1. Changes of temperature over one hour

Table 1.1 shows the percentage frequency of hourly changes of temperature of each of the eight categories. The distribution is very similar in all years. Table 1.2 shows the frequency of hourly changes of temperature of each of the eight categories at the Central Area of the United Kingdom. It is for comparison with that which would be expected from a normal distribution. The standard deviation was 0.77 °C at Plymouth and 0.81 °C at Birmingham and Luton. Table 1.3 shows the plotted frequency curve for Birmingham data with the normal curve as an approximation. The standard deviation was 0.81 °C.

The two temperature ranges -1.0°C to -0.4°C and 0.4°C to 0.9°C account for the vast majority of hourly changes, namely 90 per cent of all occurrences. In general, the differences in temperature over one hour are less than 1°C , though larger changes have been recorded.

Tables 1.1.1 and 1.2 give the percentage frequencies of temperature changes equal to or exceeding 1.0°C according to the time of day. The value of 1.0°C was chosen as being the smallest whole number approximation to 1 per cent of the number of occurrences in all stations (1715 occurrences). In fact it can be seen Birmingham has 1493 such occurrences and Manchester only 407.

As might be expected the greatest frequency of rises in temperature of 1.0°C is greatest during the morning and least at night. The frequency of falls is greatest at night and least during the morning. More than 75 per cent of the rises in temperature at Luton, Plymouth and Southampton occur in the day, whilst at the other stations it is 50 per cent. The falls in temperature of 1.0°C are more likely during the night, though morning falls occur in the late afternoon and evening.

Table 1.2 gives the distribution of 1.0 and 1.5 °C temperature changes or exceeding 1.0°C during each month.

Values of temperature of 1.0°C or more had most frequency in the spring and autumn and least in January and December. The greatest frequency of falls of 1.0°C or more occurred in the summer, whilst the least occurred in the winter.

Met O 3 (Climatological Services)

September 1980



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RATES OF CHANGE OF AIR TEMPERATURE IN THE UNITED KINGDOM IN TIME-SCALES OF BETWEEN 1 AND 6 HOURS

Introduction

This *Climatological Memorandum* investigates the rates at which air temperature can change on time-scales between 1 and 6 hours in the United Kingdom.

Eight stations, for which hourly values of air temperature are available over the 15 years 1961–75, were selected to give a broad coverage of the country: London/Heathrow Airport, Manchester Airport (Ringway), Cardiff/Wales Airport (Rhoose), Plymouth/Mount Batten, Birmingham Airport (Elmdon), Boscombe Down, Wilts., Leeming, N. Yorks., and Edinburgh Airport (Turnhouse). Temperatures for Dishforth for 1961 to September 1965 have been added to the Leeming data to provide a full 15 years of record.

The differences in temperature over 1 hour (i.e. from 1 observational hour to the next), over 3 hours (i.e. 00–03 hours, 01–04 hours, 02–05 hours, etc.) and over 6 hours (00–06 hours, 01–07 hours etc.) were calculated by computer and the percentage frequencies of these changes in 1 °C ranges of temperature were compiled for each station. The tables presented here show the distribution of such changes. A negative value indicates a fall in temperature, a positive value a rise in temperature. The times quoted are the hours at which the periods in question end.

Tables

1. *Changes in temperature over one hour*

Table 1.1 shows the percentage frequency of hourly changes in temperature at each of the eight stations. The distributions are very similar in all cases, being examples of leptokurtosis, that is to say there is an excess number of observations in the central area of the distribution and in the tail compared with what would be expected from a normal distribution. The standard deviations vary from 0.79 °C at Plymouth to 0.98 °C at Birmingham and Boscombe Down. Figure 1 shows the plotted frequency curve for Birmingham data with the normal curve for the same mean and standard deviation superimposed.

The two temperature ranges -1.0 °C to -0.1 °C and 0.0 °C to 0.9 °C account for the vast majority of hourly changes, nearly 80 per cent of all occasions. In general, the differences in temperature over one hour are less than 7 °C though larger changes have been recorded.

Tables 1.2(a) and (b) give the percentage frequencies of temperature changes equalling or exceeding 3.0 °C according to the time of day. The value of 3 °C was chosen as being the closest whole number approximation to 1 per cent of the number of occurrences at all stations (1315 occurrences). In fact as can be seen Birmingham has 1493 such occasions and Manchester only 407.

As might be expected the greatest frequency of rises in temperature of 3 °C is greatest during the morning and falls off during the afternoon and evening. More than 25 per cent of the rises in temperature at London, Plymouth and Boscombe Down occurred in the hour ended at 10 GMT. The falls in temperature of 3 °C are more widely distributed, though reaching a maximum in the late afternoon and evening.

Table 1.3 gives the distribution of rises and falls in temperature equalling or exceeding 3.0 °C during each month.

Rises in temperature of 3.0 °C or more are most frequent in the spring and autumn and least frequent in January and December. The falls in temperature are most frequent in the summer months, although at Birmingham the highest frequency occurred in September.

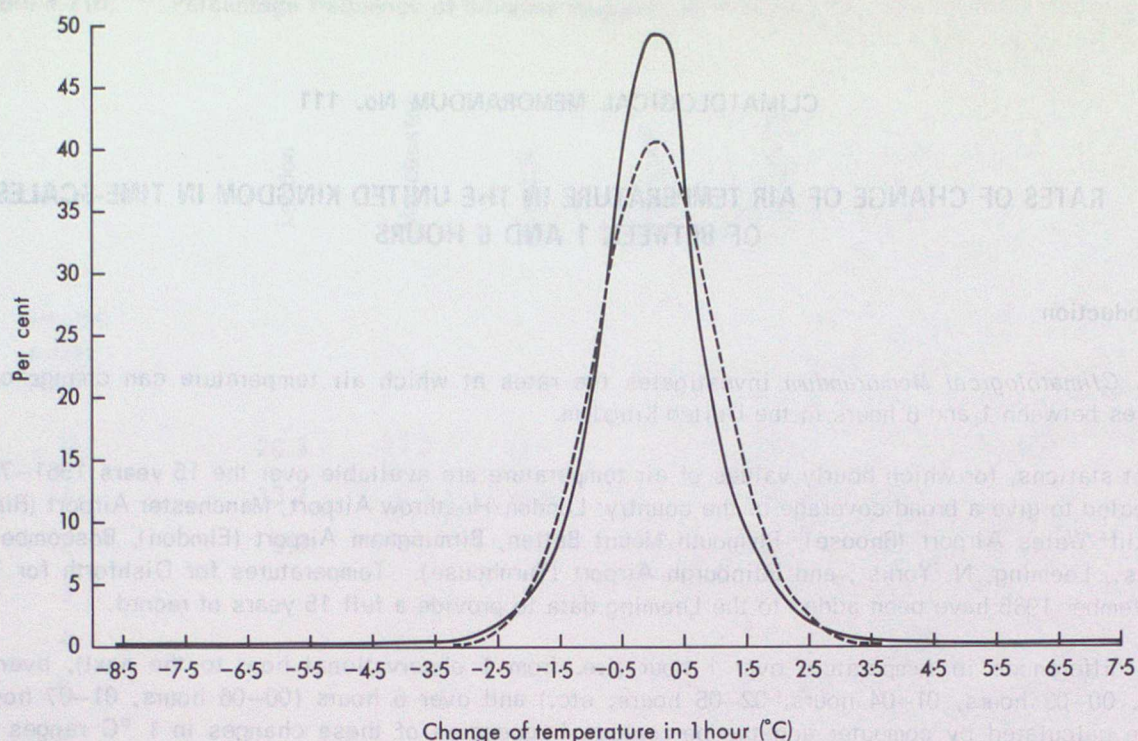


Figure 1. Distribution of 1-hourly changes in temperature at Birmingham Airport (Elmdon) for the period 1961-75
The pecked curve shows the normal distribution; standard deviation 0.98,
number of observations 131 471

Table 1.4 (a) is a combined frequency of the number of occasions of rises of 3°C or more as a function of the time of day in four separate months (December, March, June and September). Table 1.4 (b) gives similar information for falls of 3°C or more. This presentation shows that the most frequent time for large rises in temperature is about 3 to 4 hours after sunrise. There is also some evidence of a maximum in the frequency of large falls in temperature occurring around sunset but this is not so marked as the relationship between rises of temperature and sunrise.

Table 1.5 gives the frequencies of rises and falls of temperature of 5.0°C or more in a similar manner to Tables 1.2 and 1.3.

Rises of 5.0°C or more are most likely to occur before noon although isolated cases have occurred in the late evening. Most stations seem to have their greatest frequency in the autumn although Plymouth has most occasions during the winter months.

The occurrences of falls in this temperature category, like those greater than 3°C , are even more scattered both in the hours and the months, but the most likely time of occurrence seems to be between 15 and 17 GMT and between March and August.

Table 1.6 gives the absolute extreme temperature changes over 1 hour at each station for the period 1961-75, together with the weather conditions at the time. The time of occurrence of the extremes is close to the peak frequency of large changes except for the extreme temperature fall at Boscombe Down which occurred at 09 GMT and the extreme temperature rise at Edinburgh which occurred at 16 GMT.

The weather associated with these extreme changes in temperature falls into three categories:

- (a) In slack pressure gradients where a fall or rise in temperature occurs before or after cold radiation nights. The majority of cases from the eight stations come within this category.
- (b) The passage of a front and/or a wind change. Cardiff and Boscombe Down were the only stations where a front caused an extreme change in temperature. The coastal stations, especially Plymouth, had large temperature changes because of a change of wind direction from land to sea and vice versa. The phenomenal rise of temperature at Edinburgh occurred on a day with a weak south-

westerly airstream. Local easterly winds during the day brought fog from the North Sea into Edinburgh, but by 15 GMT the wind had increased and by 16 GMT it shifted to southerly replacing the sea fog with heated inland air; there was probably also a föhn effect in the lee of the Pentland Hills.

- (c) A temporary change due to squalls or thunderstorms. Both the extreme rise and extreme fall of temperature at London were caused by squalls, as were the extreme falls at Manchester and Leeming.

2. Changes in temperature over 3-hourly intervals

Similar analyses to those described for temperature changes over 1 hour were made for temperature changes over 3-hourly intervals. Each hourly temperature was related to the observation 3 hours previously so that if, for example, there was a steady rise in temperature from 06 GMT to 14 GMT this would count as 6 occasions with a positive change because of the overlapping of the 3-hourly periods. Figure 2 shows the frequency curve for Plymouth with the normal distribution curve superimposed.

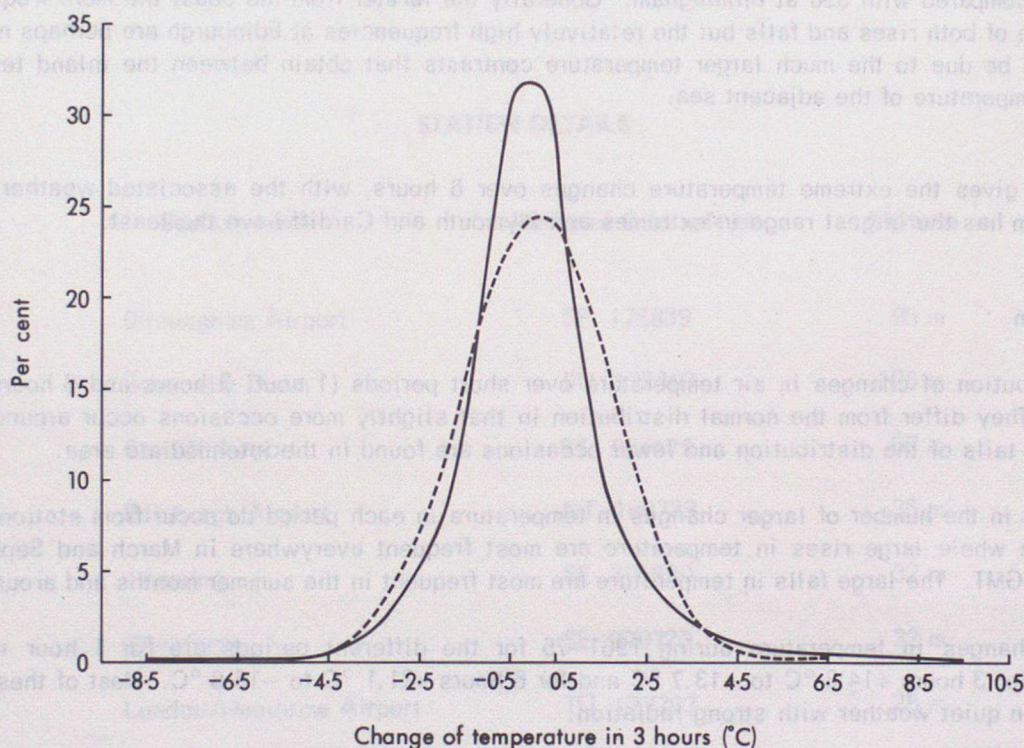


Figure 2. Distribution of 3-hourly changes in temperature at Plymouth/Mount Batten for the period 1961-75
The pecked curve shows the normal distribution; standard deviation 1.62, number of observations 131 469

Table 2.1 gives the frequency of 3-hourly changes in temperature. The forms of distribution are similar to those of the 1-hourly changes.

Tables 2.2 to 2.4 give the diurnal and monthly frequencies of 3-hourly changes equal to or exceeding 6.0 °C (again generally about 1 per cent of all occasions) and 9.0 °C.

Table 2.5 lists the extreme values of temperature change over 3 hours for the period 1961-75 together with a brief description of the associated weather. At Manchester, Cardiff and Plymouth they range from about -9.0 °C to 11.0 °C; London has a slightly larger range and at Birmingham, Leeming, Boscombe Down and Edinburgh the range is from about -13.0 °C to 14.0 °C. The weather in the majority of cases was quiet, the extremes occurring before or after a cold radiation night. Only in two cases were the falls due to a passage of a cold front.

3. *Changes in temperature over 6-hourly intervals*

In a similar way to the tables for 3-hourly intervals frequency distributions have been compiled for 6-hourly changes in temperature.

Table 3.1 gives the distribution of 6-hourly changes in temperature at each of the eight stations.

Tables 3.2 and 3.3 give the diurnal and monthly frequencies of changes of 10°C or more over 6-hourly intervals. These again constitute about 1 per cent of all occasions. No frequencies were produced for any larger temperature change in this time interval.

It will be seen that the variation across the country of the total number of occurrences of large temperature changes is much more marked than is the case with the changes in shorter time intervals. The ratio between the number of rises of 10°C at Birmingham, the station with most occurrences (1515), and the number of rises at Cardiff, the station with least occurrences (196), is over 7.5. The variation in the frequency of falls of 10°C in temperature is even more marked. There were only 3 occasions at Plymouth compared with 396 at Birmingham. Generally the farther from the coast the more frequent is the occurrence of both rises and falls but the relatively high frequencies at Edinburgh are perhaps noteworthy; these may be due to the much larger temperature contrasts that obtain between the inland temperatures and the temperature of the adjacent sea.

Table 3.4 gives the extreme temperature changes over 6 hours, with the associated weather situation. Birmingham has the largest range in extremes and Plymouth and Cardiff have the least.

Conclusion

The distribution of changes in air temperature over short periods (1 hour, 3 hours and 6 hours) are very similar. They differ from the normal distribution in that slightly more occasions occur around the mean and at the tails of the distribution and fewer occasions are found in the intermediate area.

Variations in the number of larger changes in temperature in each period do occur from station to station but on the whole large rises in temperature are most frequent everywhere in March and September and around 10 GMT. The large falls in temperature are most frequent in the summer months and around 19 GMT.

Extreme changes in temperature during 1961–75 for the different periods are for 1 hour $+12.4^{\circ}\text{C}$ to -8.7°C ; for 3 hours $+15.1^{\circ}\text{C}$ to -13.7°C and for 6 hours $+21.1^{\circ}\text{C}$ to -15.8°C . Most of these extremes occurred in quiet weather with strong radiation.

It is hoped that the statistics contained in this memorandum will be of interest to engineers who are concerned with heating, air-conditioning and refrigeration; and also to those who are faced with the problem of assessing the effect of rapid rises or falls of temperature on the storage or transportation of perishable goods, foodstuffs and chemicals.

TABLES

STATION DETAILS

Station name	National Grid reference	Altitude
Birmingham Airport	SP 176839	96 m
Boscombe Down	SU 172403	126 m
Cardiff Airport	ST 064679	67 m
Edinburgh Airport	NT 159739	35 m
Leeming	SE 306890	32 m
Dishforth	SE 379723	32 m
London/Heathrow Airport	TQ 077767	25 m
Manchester Airport	SJ 821849	75 m
Plymouth/Mount Batten	SX 492529	27 m

Table 1.1 Percentage frequency of hourly changes in temperature, 1961-75

Temperature difference* (°C)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
-9.0 to -8.1					0.00 ⁺		0.00 ⁺	0.00 ⁺
-8.0 to -7.1	0.00 ⁺				0.00 ⁺			0.00 ⁺
-7.0 to -6.1	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺
-6.0 to -5.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
-5.0 to -4.1	0.03	0.03	0.03	0.02	0.06	0.03	0.03	0.05
-4.0 to -3.1	0.11	0.08	0.11	0.07	0.31	0.21	0.16	0.22
-3.0 to -2.1	0.69	0.55	0.87	0.41	1.6	1.3	1.1	1.4
-2.0 to -1.1	7.5	5.9	6.4	4.7	8.0	8.4	7.7	7.8
-1.0 to -0.1	41.5	41.6	39.1	42.2	37.4	38.1	39.2	38.2
0.0 to 0.9	38.1	42.1	43.5	44.8	40.4	39.0	40.2	40.8
1.0 to 1.9	9.6	8.2	8.2	6.3	9.6	9.9	8.9	8.9
2.0 to 2.9	2.1	1.3	1.5	1.2	2.0	2.5	2.1	2.0
3.0 to 3.9	0.27	0.15	0.22	0.24	0.51	0.44	0.48	0.51
4.0 to 4.9	0.03	0.02	0.03	0.05	0.13	0.07	0.08	0.10
5.0 to 5.9	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.02	0.03	0.01	0.02	0.02
6.0 to 6.9				0.01	0.01	0.00 ⁺	0.00 ⁺	0.01
7.0 to 7.9				0.00 ⁺	0.00 ⁺			0.00 ⁺
8.0 to 8.9				0.00 ⁺			0.00 ⁺	
9.0 to 9.9				0.00 ⁺				0.00 ⁺
10.0 to 10.9								
11.0 to 11.9								
12.0 to 12.9								0.00 ⁺

* A negative value indicates a fall in temperature; a positive value a rise in temperature.

0.00⁺ is less than 0.005 per cent but greater than zero.

Table 1.2(a) Percentage frequency of 1-hourly temperature rises of 3.0 °C or more, 1961–75

Hour ended (GMT)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
0			0.9	1.2	0.5	0.1	1.1	0.6
1		0.9	1.2	1.4	0.5		0.5	0.6
2	0.2		0.6	1.6	0.7		0.9	0.7
3	0.2		1.2	1.6	0.6	0.3	0.4	1.2
4			0.6	2.8	1.0	0.6	0.8	1.2
5		0.4	2.1	2.8	1.4		1.1	1.2
6			4.5	2.6	8.0	2.7	3.7	3.0
7	0.7	4.4	17.6	5.8	22.5	6.5	9.1	9.8
8	10.4	17.6	20.9	14.0	14.5	19.5	14.8	16.2
9	19.9	19.0	16.4	14.9	14.9	18.6	12.6	16.2
10	25.9	20.7	15.5	25.6	17.3	25.1	20.5	15.2
11	17.6	17.2	6.2	10.0	7.9	11.6	13.3	10.5
12	10.9	8.8	4.8	5.4	4.1	7.1	9.5	7.6
13	5.3	4.4	2.7	4.2	2.2	3.4	6.6	5.2
14	2.7	4.0	1.5	1.2	1.0	2.4	1.6	3.4
15	2.7	1.2	0.3	1.2	1.1	1.0	1.2	1.9
16	1.0	0.4	0.6	0.7	0.2	0.5	0.4	1.9
17	0.5		0.3	0.9	0.1		0.4	0.7
18	0.2		0.6	0.2	0.2	0.1	0.4	0.6
19		0.4		0.2	0.1			0.5
20	0.2		0.3		0.3		0.4	0.3
21				0.3	0.3	0.1		0.6
22		0.4	0.6	0.7	0.6	0.1	0.4	0.3
23			0.6	0.3	0.3	0.3	0.3	0.6
No. of occasions	411	227	335	429	880	674	756	853

Table 1.2(b) Percentage frequency of 1-hourly temperature falls of 3.0 °C or more, 1961–75

Hour ended (GMT)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
0		0.6	4.5	1.3	3.4	1.2	2.2	1.6
1	0.5	2.8	1.4	2.0	4.2	1.4	1.0	1.9
2	0.5	2.2	1.8	4.0	4.6	2.4	1.0	1.2
3	1.8	1.1	2.7	2.0	1.6	1.9	1.0	1.2
4	0.9	1.1	4.5	0.7	1.3	0.7	1.3	0.5
5	0.9	1.1	1.8	0.7	1.3	1.9	1.9	1.6
6		1.7	0.9	2.0	1.6	1.0		0.2
7	0.5	1.7	1.3	2.0	0.2	1.2	1.3	
8	0.9	1.1	0.9	3.3	1.0	0.5	0.3	
9	0.9	2.2	0.9		0.7	0.5		0.5
10	2.3	1.7	0.9	2.7	0.2	0.7	0.6	0.5
11	2.8	2.2	1.4	2.7	0.3	1.4	1.6	0.9
12	2.8	2.2	2.7	6.7	2.6	2.7	3.5	2.3
13	4.1	8.9	1.8	6.0	3.3	4.6	4.1	3.3
14	8.7	6.1	4.1	8.1	2.4	5.3	7.3	6.1
15	13.8	10.6	7.7	8.7	4.7	6.3	8.9	6.7
16	12.9	10.0	7.7	8.1	5.1	7.2	10.5	7.2
17	12.0	12.2	10.0	12.1	5.9	6.0	10.5	10.3
18	11.5	7.2	7.7	10.1	8.3	10.6	9.9	10.9
19	6.5	10.6	14.0	7.4	14.5	16.9	15.6	13.5
20	6.5	5.6	9.1	4.0	11.1	13.3	9.6	13.3
21	2.3	3.3	6.3	3.4	7.0	5.8	4.1	8.4
22	4.6	3.3	3.6	2.0	10.3	3.6	2.5	4.9
23	2.3	0.5	2.3		4.4	2.9	1.3	3.0
No. of Occasions	217	180	221	149	613	415	314	429

Table 1.3(a) Percentage frequency of 1-hourly temperature rises of 3.0 °C or more in each month, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
January	2.2	3.1	0.9	6.1	1.5	0.5	3.8	4.2
February	2.2	4.0	3.6	5.1	2.7	2.2	4.5	6.3
March	21.2	12.8	14.3	10.3	11.5	13.6	8.7	8.3
April	10.0	15.4	10.4	7.5	8.5	10.7	7.8	11.0
May	10.0	11.5	10.7	5.1	11.1	9.9	11.0	9.7
June	5.6	7.5	7.8	7.2	10.3	11.1	11.9	9.4
July	5.3	2.6	6.3	6.7	8.9	8.2	7.7	7.9
August	10.2	7.9	8.1	7.9	12.7	11.1	9.8	9.6
September	15.1	15.0	13.4	12.1	13.2	15.6	12.4	11.4
October	14.1	9.2	10.7	11.2	10.8	11.7	10.5	12.9
November	2.9	4.8	9.0	12.6	5.4	3.6	6.7	5.9
December	1.2	6.2	4.8	8.2	3.4	1.8	5.2	3.4
No. of occasions	411	227	335	429	880	674	756	853

Table 1.3(b) Percentage frequency of 1-hourly temperature falls of 3.0 °C or more in each month, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
January	1.4	5.0	5.4	6.7	2.9	2.7	4.8	3.3
February	3.7	4.4	3.6	4.7	3.1	2.7	6.4	4.7
March	8.3	5.6	11.7	6.0	9.0	10.8	6.7	7.5
April	12.9	8.9	10.0	9.4	10.1	8.4	11.8	10.9
May	12.9	16.1	13.6	12.1	10.1	11.3	16.9	13.3
June	17.5	20.0	9.5	16.8	12.6	15.2	9.6	10.3
July	10.6	6.1	10.8	14.8	8.3	9.9	10.5	11.6
August	12.0	13.3	11.3	6.7	12.4	12.5	12.1	12.1
September	7.4	6.7	10.9	6.0	12.7	11.1	8.9	10.3
October	4.1	3.9	5.0	4.7	9.8	7.0	6.4	9.3
November	5.5	4.4	5.9	6.7	4.4	4.3	2.2	4.2
December	3.7	5.6	2.3	5.4	4.6	4.1	3.8	2.5
No. of occasions	217	180	221	149	613	415	314	429

Table 1.4(a) Number of occasions with hourly temperature rises of 3.0 °C or more, 1961-75, grouped according to season and time

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Time (GMT)																							
	Number of occasions																							
London (Heathrow)																								
Dec.									/	2				1		1								
Mar.					/		/		1	19	31	18	10	7		1								
June				/				1	4	9	2	1	1			2	1	2						
Sept.					/				3	14	24	18	4	1	1									
Manchester (Ringway)																								
Dec.		1							1/			6	3	1					1					1
Mar.									1	9	12	3	3		1									
June					/			5	5	2	1				2									
Sept.						1/				7	10	7	5	4		1								
Cardiff (Rhoose)																								
Dec.	1			1		1			/		2	5	1	1							1		2	1
Mar.					/		/		9	18	12	2	2	3		3						1		
June				/		1	5	11	1	1	1		3		1									
Sept.	1	1			2	2	1/	2	16	12	6	1	3	1	2									
Plymouth (Mount Batten)																								
Dec.	2	1	3	1	4	1	1	2	2/	3	4	3	2	3	1								1	1
Mar.			2	1	1		1/	2	1	12	19	3	1	3										
June				/			2	3	7	4	4	2	1			2		1	1				1	
Sept.				2		4	/	1	4	22	17	1												

Table 1.4(a) — (continued)

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Time (GMT)																							
	Number of occasions																							
Birmingham (Elmdon)																								
Dec.	3	2				1	1		/		8	8	2	1			1						2	
Mar.			1	2	2	2	/	2	10	30	29	10	5	3	1									
June			/		1	1	42	29	3	3	6	1	4	1	1	2		1						
Sept.	1	1	1	2	2	1	/	8	37	31	21	7	2	2										
Boscombe Down																								
Dec.							1	1	/	1	1	3	3	1									1	
Mar.				1			1	/	4	19	35	14	3	9	5	1								
June			/				4	18	26	8	5	2	4	1	2	1	1							
Sept.			1	1	1		1	/	11	30	39	14	6	1	2									
Leeming																								
Dec.	4		3		1	1	1	1	/	2	1	8	6	1	3	1		2	1		1		1	
Mar.				1	1	2	1	/	2	9	15	11	13	5	1									
June			/				9	16	25	14	16	6		4	2									
Sept.							2	/	1	17	25	28	12	5	1	1								
Edinburgh (Turnhouse)																								
Dec.	1			2	1	1		1	2	/	2	4	8	1	1			1	2		2		1	
Mar.	1	1		1			1	/	2	4	20	23	6	3	3	1	1	3					1	
June			/			3	6	29	12	3	5	3	3	5	4	2			1					
Sept.			2	3	3		1	/	26	37	14	10	3	1	2	1		1		1	1	1	1	

181/ denotes approximate time of sunrise 1861/ denotes approximate time of sunset 1861/ denotes approximate time of sunset 1861/ denotes approximate time of sunset

Table 1.4 (b) Number of occasions with hourly temperature falls of 3.0 °C or more, 1961–75 grouped according to season and time

		Time (GMT)																							
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
		Number of occasions																							
London (Heathrow)																									
Dec.			1					1			1						1	/	1	1	1				1
Mar.					1			1			1					3	3			5/	2				
June	1							1			1			2	1	8	1	3	5	7	2	2/	3	2	
Sept.													2	2	2	2	2	2	2	2/	2		1		
Manchester (Ringway)																									
Dec.							3	1							1		1	/	1	1	1				
Mar.															1	1	1	1	4	1/	1		1		
June	1					1							1		4	2	5	2	4	2	6	3/	3	2	
Sept.			1								1	1	1		1		2	2	2	3	/				
Cardiff (Rhoose)																									
Dec.									1	1		1		1				/							
Mar.			1		1		2				1	1	2		1	1		4	2	2/	5	1	1	1	
June	2																3	1	1	5	2	1/	3	1	
Sept.	1		1	3	3	1							2				2		1	/	4	3	2	1	
Plymouth (Mount Batten)																									
Dec.	1		1				2		1		1				1		1	/							
Mar.		1	1								1				1				1	1/	1	3			
June	1			1							2	1	3		3	2	1	3	2	2	4	1/			
Sept.														1	1	1	1		1	2/	2				

/ denotes approximate time of sunset

Table 1.4 (b) – (continued)

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Number of occasions																							
Birmingham (Elmdon)																								
Dec.	2		3	1		1	1		5	1		1	1		1	1	/	5	2	1	1	2		
Mar.	3	3	2	1	2		1					2	1		1	1	6		3/	12	9	5		1
June	5	9	7	1	2			1				2	4		2	5	6	4	2	4	2/	9	8	5
Sept.	2		2	3		1						2	2		2	2	3		8/	29	11	6	1	5
Boscombe Down																								
Dec.	1	1			1		2		1		2	1	1		1	2	/3			2	1			1
Mar.				2	1	1							1		1	1	3	4	10/	11	11	2		1
June			2	2								1	1		1	3	2	1	4	7	15/	8	6	3
Sept.	1	1	1	1	1	1		1					3		2	2	3	1	5/	16	2			1
Leeming																								
Dec.	3	2				1		2				2	1		2	3	/1			1				1
Mar.				2				1				1	1		1	2	3		1/	5	3	4/	2	3
June	1				1								1		1	4	1	4		3	2			
Sept.												1			3	2	3	3	4/	11	2			
Edinburgh (Turnhouse)																								
Dec.	1		1	1		2				1					1	2	/	2	1					2
Mar.		2	1											1	1	2	1	2	3/	8	7	2	1	1
June			1									1	2		3	1	7	1	5	6	6/	6	4	1
Sept.				1		1								1	4	5	2	4	2/	12	7	1	2	2

/ denotes approximate time of sunset

Table 1.5 Number of occasions with 1-hourly temperature change 5.0 °C or more, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
Hour ended (GMT)	(a) Rises								(b) Falls							
0							1	1			1		1			
1				2			3						2			
2							1						2	1		
3			1	2					1	1			1			
4				5									2		1	
5				3	1			1			1				1	
6				5	1			4					1			
7			2	2	12		1	1		1	1				1	
8		1		5	13	1	4	4	1							
9				3	8	1		9	1					1		
10	1	3		7	8	5	1	4	1	1						
11	2			5	5		6	4	1	1		1				
12	1				2		2	2	1			1		1		1
13				1			2	1		3		2	5	1		2
14										1			1	4	2	
15				1				3	4	2	2	3	3	4	5	1
16							1		5	1	1	1	2	2	2	3
17									1			6	3	1	4	3
18									1		2		1	1	1	1
19												1	3	1	2	2
20							1			1		2	1	1		
21						1		1					1	1		3
22				1						1		1	1	2		
23							1						2			
Total	4	4	3	42	50	8	23	36	17	13	8	18	32	20	20	16
Month																
Jan.				6	2		4		1	1	1		1	1		1
Feb.		1		4			2	2	1	1			1	1	1	
Mar.	2	1		1	6	5		2	1	1			4	1	2	1
Apr.	1	1		1	8		2	4	6		1	3	3	3	3	2
May					5		2	3	1	2	1	4	8	3	3	5
June				2			1		2	3	2	5	3	2	2	2
July								4	2	1		5	2	3	3	2
Aug.				2	3		2	4		2	2	1	1	1	3	3
Sept.	1	1	2	1	12		2	4			1		3	2	1	
Oct.				3	11	2	5	11		1						
Nov.				15		1	1		1				3	3	1	
Dec.			1	7	3		2	2	2	1			3		1	
Total	4	4	3	42	50	8	23	36	17	13	8	18	32	20	20	16

Table 1.6 Extreme hourly changes in temperature, 1961–75

	Date	From Time GMT	Temp. °C	To Time GMT	Temp °C	Temperature difference °C	Remarks
London							
Rise	13/4/69	11	2.8	12	8.4	5.6	NW'ly airstream; showers of rain and hail. A fall followed by a rise in a squall. 10 GMT: 8.0 °C. Slack gradient. Squall and heavy thunderstorm.
Fall	11/6/70	17	25.9	18	18.6	−7.3	
Manchester							
Rise	29/3/65	08	7.8	09	13.5	5.7	Ridge from SE. Heating after a cold, clear night. Min. temp.3 °C. 07 GMT: 3.6 °C. Low southern Ireland, slack gradient. Showers and thunderstorm.
Fall	3/7/63	15	19.5	16	13.2	−6.3	
Cardiff							
Rise	26/9/61	06	6.4	07	12.2	5.8	Ridge over southern England and Wales. Heating after cold, clear night. Cold front passing station.
Fall	29/8/61	15	27.2	16	20.5	−6.7	
Plymouth							
Rise	5/1/61	09	−0.8	10	8.4	9.2	Ridge ahead of warm front moving in from Atlantic. Min. temp. −2 °C. Wind change from 040/03 to 240/15. Col, 1/8 Cb. Wind change 070/10 to 210/09.
Fall	10/6/63	16	23.8	17	16.9	−6.9	
Birmingham							
Rise	24/1/63	07	−14.1	08	−6.3	7.8	Freezing fog lifting (with wind increase from calm to 5 knots) to low stratus Ridge from SE. Light wind falling to calm; small amounts of medium cloud. Further fall to 21 GMT 9.2 °C, 22 GMT 5.4 °C.
Fall	29/3/65	19	18.3	20	9.6	−8.7	
Boscombe Down							
Rise	16/3/72	08	2.9	08	9.5	6.6	Ridge across country. Rise after a clear night. Cold front moving from NW, with rain and snow.
Fall	2/4/68	08	7.5	09	0.9	−6.6	
Dishforth/Leeming							
Rise	21/12/63	10	−6.5	11	1.7	8.2	High to SW. Heating after cold, clear night. Col. Thunderstorms.
Fall	11/8/69	15	26.2	16	18.1	−8.1	
Edinburgh							
Rise	8/4/69	15	7.0	16	19.4	12.4	Slack SW'ly gradient. Change of wind from 030 ° to 190 ° Easterly gradient wind change from 280 ° to 040 °.
Fall	20/7/72	17	25.5	18	17.4	−8.1	

Table 2.1 Percentage frequency of 3-hourly changes in temperature, 1961–75

Temperature difference* (°C)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
–14.0 to –13.1								0.00 ⁺
–13.0 to –12.1					0.00 ⁺			
–12.0 to –11.1								0.00 ⁺
–11.0 to –10.1					0.01	0.00 ⁺		0.00 ⁺
–10.0 to –9.1	0.00 ⁺				0.01	0.00 ⁺	0.00 ⁺	0.00 ⁺
–9.0 to –8.1	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺	0.03	0.01	0.01	0.01
–8.0 to –7.1	0.01	0.01	0.01	0.01	0.08	0.05	0.05	0.04
–7.0 to –6.1	0.06	0.03	0.07	0.02	0.39	0.22	0.18	0.22
–6.0 to –5.1	0.31	0.19	0.27	0.07	0.81	0.76	0.58	0.59
–5.0 to –4.1	1.2	0.76	1.0	0.39	1.8	1.9	1.5	1.5
–4.0 to –3.1	3.9	2.5	2.5	1.7	3.7	4.0	3.3	3.3
–3.0 to –2.1	8.7	6.8	6.0	5.3	7.3	7.7	7.2	6.8
–2.0 to –1.1	15.1	15.2	13.4	13.7	13.5	13.9	13.8	13.2
–1.0 to –0.1	24.0	26.8	27.7	30.8	23.7	23.6	25.8	25.6
0.0 to 0.9	20.1	23.0	25.6	28.0	21.5	20.9	21.9	23.3
1.0 to 1.9	11.1	12.2	11.6	10.6	12.1	11.1	11.3	11.7
2.0 to 2.9	6.7	6.6	6.0	4.7	7.1	6.7	6.5	6.5
3.0 to 3.9	4.0	3.2	3.1	2.3	3.8	4.0	3.5	3.5
4.0 to 4.9	2.4	1.5	1.6	1.2	2.0	2.4	2.0	1.8
5.0 to 5.9	1.3	0.76	0.74	0.69	0.99	1.4	1.1	0.95
6.0 to 6.9	0.67	0.32	0.28	0.31	0.56	0.77	0.66	0.50
7.0 to 7.9	0.27	0.11	0.10	0.15	0.31	0.34	0.36	0.29
8.0 to 8.9	0.09	0.03	0.02	0.06	0.22	0.15	0.15	0.13
9.0 to 9.9	0.04	0.01	0.00 ⁺	0.01	0.11	0.04	0.05	0.06
10.0 to 10.9	0.01	0.00 ⁺		0.00 ⁺	0.05	0.02	0.02	0.02
11.0 to 11.9	0.01	0.00 ⁺			0.02	0.00 ⁺	0.00 ⁺	0.01
12.0 to 12.9		0.00 ⁺			0.01	0.00 ⁺	0.00 ⁺	0.00 ⁺
13.0 to 13.9	0.00 ⁺				0.00 ⁺			
14.0 to 14.9	0.00 ⁺				0.00 ⁺	0.00 ⁺		0.00 ⁺
15.0 to 15.9							0.00 ⁺	

* A negative value indicates a fall in temperature; a positive value a rise in temperature.

0.00⁺ is less than 0.005 per cent but greater than zero.

Table 2.2(a) Percentage Frequency of 3-hourly temperature rises of 6.0°C or more, 1961–75

Hour ended (GMT)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
0		0.1		0.4		0.1	0.1	0.3
1		0.1		0.3			0.1	0.2
2				0.8			0.2	
3	0.1			0.6			0.1	
4		0.2		1.3				0.3
5			0.2	1.7		0.1	0.1	0.3
6		0.2		2.0	0.3	0.1	0.1	2.2
7	0.1	5.4	1.3	8.7	5.1	0.3	0.9	12.5
8	4.3	19.0	14.9	17.7	16.2	9.4	9.4	21.6
9	16.0	30.1	27.0	24.6	22.1	20.7	18.3	21.7
10	27.8	23.5	26.6	21.4	20.6	28.4	21.0	19.2
11	23.5	12.5	17.7	13.8	17.5	22.0	19.9	12.5
12	16.6	6.9	9.1	5.4	12.1	13.1	15.4	6.3
13	8.0	1.3	2.1	1.0	4.7	4.6	8.8	1.6
14	2.9	0.5	0.7	0.1	1.1	1.0	3.9	0.3
15	0.6	0.2	0.2		0.1	0.3	1.0	0.2
16							0.1	0.3
17	0.1						0.1	0.2
18				0.1	0.1			0.1
19					0.1		0.1	0.1
20							0.1	
21							0.1	
22			0.2				0.1	0.1
23				0.1			0.1	
No. of occasions	1433	625	537	711	1675	1792	1643	1341

Table 2.2(b) Percentage frequency of 3-hourly temperature falls of 6.0 °C or more, 1961–75

Hour ended (GMT)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
0	3.6		1.4	2.1	5.1	0.5	1.3	1.9
1	1.8		0.7		2.9	0.2	0.3	2.1
2		2.8			1.5		0.3	0.5
3		1.4			1.0	0.7	0.3	0.5
4		1.4	0.7		0.6	0.5		0.2
5		2.8	0.7		0.3		0.8	0.2
6			0.7		0.3		0.3	
7		1.4	0.7					
8	0.9	1.4	0.7		0.2		0.2	
9	0.9	4.2	0.7				0.2	
10	1.8	4.2						
11	0.9	1.4		2.1				
12				2.1				
13	1.8			2.1				0.2
14				2.1		0.3		0.2
15	1.8		0.7	2.2		0.5	0.8	0.2
16	2.7	1.4	2.1	6.4	0.3	1.0	1.8	0.5
17	2.7	5.5	6.9	14.9	1.1	1.9	3.1	2.1
18	8.0	8.3	6.2	14.9	2.7	3.7	4.2	7.9
19	12.5	12.5	15.3	17.0	11.7	16.0	11.5	14.8
20	14.3	15.3	23.6	12.8	21.1	28.4	23.6	20.1
21	18.7	11.1	22.9	12.8	21.9	32.5	26.2	19.9
22	18.7	18.0	11.8	8.5	20.1	12.1	20.4	20.1
23	8.9	6.9	4.2		9.2	1.7	4.7	8.6
No. of occasions	112	72	144	47	622	412	382	432

Table 2.3 (a) Percentage frequency of monthly values of 3-hourly temperature rises of 6.0 °C or more, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
January	0.7	1.0	1.1	3.2	1.2	0.3	1.4	2.0
February	1.8	3.2	2.8	4.1	2.0	1.9	3.2	6.0
March	13.8	13.1	14.5	11.0	10.0	11.6	8.0	8.1
April	10.6	13.7	9.5	7.6	9.3	10.0	9.4	12.2
May	11.4	11.5	9.5	7.0	12.5	10.0	12.8	9.7
June	12.8	13.9	9.9	6.6	13.6	11.8	14.7	10.1
July	7.5	5.4	10.2	5.6	9.4	10.3	8.0	8.5
August	12.6	9.9	11.5	8.7	13.1	13.2	13.9	11.7
September	15.4	14.4	15.1	15.4	14.2	18.1	14.1	12.7
October	10.7	9.4	9.3	12.9	10.0	9.1	9.9	11.9
November	2.1	2.6	4.7	12.1	3.0	3.1	3.5	5.2
December	0.6	1.9	1.9	5.8	1.7	0.6	1.1	1.9
No. of occasions	1433	625	537	711	1675	1792	1643	1341

Table 2.3 (b) Percentage frequency of monthly values of 3-hourly temperature falls of 6.0 °C or more, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
January		1.4			0.5	0.5	1.3	2.8
February	0.9	11.1	0.7		0.8	0.7	3.4	4.9
March	13.4	8.3	6.3	6.4	8.5	12.6	6.5	7.2
April	4.5	6.9	11.8	8.5	6.3	6.3	7.9	10.4
May	15.2	13.9	11.8	14.9	8.8	11.2	16.8	10.6
June	25.9	25.0	20.8	31.9	6.4	16.7	18.6	14.1
July	7.1	6.9	13.2	23.4	9.3	14.6	14.4	13.2
August	17.0	11.1	15.3	10.7	14.5	17.0	13.9	11.3
September	4.5	2.8	12.5	2.1	17.7	11.7	9.9	11.1
October	4.4	5.6	5.5		13.3	6.3	4.7	9.7
November	6.2	4.2	2.1	2.1	2.6	2.4	1.8	3.5
December	0.9	2.8			1.3		0.8	1.2
No. of occasions	112	72	144	47	622	412	382	432

Table 2.4 Number of occasions with 3-hourly temperature change of 9.0 °C or more, 1961–75

3 hours ended (GMT)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
	(a) Rises								(b) Falls							
0																
1				1												
2								1					1			
3							1						1			
4				1												
5				1												
6				1									2			
7					3											
8					32		5	4								
9	2	1		1	64	5	13	17			1					
10	13	9	2	6	69	24	26	39								
11	29	8	1	9	52	28	25	37	1					1		
12	19	3		4	26	21	21	16								
13	13	1			5	5	11	5								
14	2				1	2	3	1								
15	1															
16								1								
17								1	1							
18								1								1
19													2			2
20									1				8			1
21													6	2		3
22													2	1		2
23																1
Total	79	22	3	24	252	85	105	123	3	0	1	0	22	2	2	10
Month																
Jan.				3	2		1									
Feb.	2	2			1	1	2	11								
Mar.	37	5	2	5	43	26	8	11					4			
Apr.	2	7	1		21	6	10	19	1		1		2	1		1
May	4	1			32		9	8								
June	2				22	4	17	3	1				1	1	1	2
July	1				5	1	4	9								3
Aug.	2	1			30	11	10	16					2		1	2
Sept.	15	4		4	52	18	20	23					6			2
Oct.	14	1		4	40	17	18	21	1				5			
Nov.				4	3	1	3	1					2			
Dec.		1		4	1		3	1								
Total	79	22	3	24	252	85	105	123	3	0	1	0	22	2	2	10

Table 2.5 Extreme 3-hourly changes in temperature, 1961-75

	Date	From Time GMT	Temp. ° C	To Time GMT	Temp. ° C	Temperature difference ° C	Remarks
London							
Rise	29/3/65	08	1.7	11	16.0	14.3	Ridge from SE. Heating after cold, clear night.
Fall	2/4/68	08	9.5	11	-0.3	-9.8	Cold front crossing station from NW.
Manchester							
Rise	29/3/65	07	3.6	10	16.0	12.4	Ridge from SE. Heating after cold, clear night.
Fall	14/6/69	16	23.9	19	15.6	-8.3	Col.
Cardiff							
Rise	8/3/69	08	-1.8	11	7.7	9.5	High pressure area. Heating after clear night.
Fall	2/4/68	06	7.5	09	-1.5	-9.0	Cold front crossing station from NW.
Plymouth							
Rise	29/12/64	01	-4.8	04	5.8	10.6	Ridge. Warm front approaching.
Fall	7/6/70	17	22.9	20	14.8	-8.1	Slack low pressure area.
Birmingham							
Rise	29/3/65	07	0.7	10	14.8	14.1	Ridge from SE. Heating after cold, clear night.
Fall	29/3/65	19	18.3	22	5.4	-12.9	Ridge from SE. Cold, clear night.
Boscombe Down							
Rise	29/3/65	07	-0.4	10	14.0	14.4	Ridge from SE. Heating after cold clear, night.
Fall	8/6/62	19	21.5	22	11.3	-10.2	High pressure area. Cold, clear night.
Dishforth/Leeming							
Rise	2/4/65	10	1.1	13	16.2	15.1	Ridge. Heating after cold, clear night.
Fall	14/8/73	17	26.2	20	16.6	-9.6	SE'ly gradient. Cold, clear night. Fog.
Edinburgh							
Rise	8/4/69	13	5.2	16	19.4	14.2	SW'ly gradient.
Fall	20/7/72	16	28.2	19	14.5	-13.7	Easterly gradient. Fog from North Sea.

Table 3.1 Percentage frequency of 6-hourly changes in temperature, 1961–75

Temperature difference* (°C)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
–16.0 to –15.1					0.00 ⁺			
–15.0 to –14.1					0.00 ⁺		0.00 ⁺	0.00 ⁺
–14.0 to –13.1					0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺
–13.0 to –12.1	0.00 ⁺		0.00 ⁺		0.02	0.00 ⁺	0.01	0.01
–12.0 to –11.1	0.00 ⁺		0.01		0.06	0.01	0.03	0.02
–11.0 to –10.1	0.02	0.01	0.02	0.00 ⁺	0.19	0.06	0.12	0.07
–10.0 to –9.1	0.09	0.04	0.05	0.01	0.40	0.20	0.24	0.22
–9.0 to –8.1	0.38	0.15	0.15	0.03	0.71	0.60	0.50	0.44
–8.0 to –7.1	0.80	0.42	0.47	0.13	1.1	1.2	0.91	0.89
–7.0 to –6.1	1.8	0.92	1.0	0.52	1.7	2.0	1.5	1.5
–6.0 to –5.1	3.3	1.9	2.0	1.3	2.8	3.3	2.5	2.4
–5.0 to –4.1	5.1	3.7	3.2	2.8	4.1	4.7	4.1	3.9
–4.0 to –3.1	6.9	6.2	5.3	4.9	6.0	6.3	6.1	5.7
–3.0 to –2.1	9.1	9.6	8.3	8.3	8.4	8.6	8.7	8.2
–2.0 to –1.1	11.9	13.2	13.0	13.6	11.6	11.2	12.1	11.8
–1.0 to –0.1	14.2	16.7	18.5	20.9	14.7	14.4	16.0	16.7
0.0 to 0.9	12.4	14.3	16.7	19.3	13.2	12.7	13.9	14.9
1.0 to 1.9	9.1	10.5	10.6	10.6	9.8	9.2	9.6	10.2
2.0 to 2.9	6.8	7.7	7.2	6.5	7.5	6.8	7.1	7.3
3.0 to 3.9	5.3	5.3	4.8	3.9	5.7	5.2	5.2	5.2
4.0 to 4.9	3.9	3.6	3.2	2.7	3.9	4.0	3.6	3.7
5.0 to 5.9	2.9	2.2	2.1	1.7	2.7	2.9	2.5	2.5
6.0 to 6.9	2.1	1.5	1.5	1.2	1.7	2.1	1.7	1.6
7.0 to 7.9	1.4	0.93	1.0	0.81	1.2	1.6	1.2	1.0
8.0 to 8.9	1.1	0.57	0.53	0.43	0.81	1.2	0.86	0.67
9.0 to 9.9	0.68	0.35	0.24	0.24	0.59	0.77	0.63	0.44
10.0 to 10.9	0.43	0.18	0.09	0.09	0.41	0.47	0.38	0.38
11.0 to 11.9	0.23	0.08	0.04	0.04	0.29	0.25	0.25	0.19
12.0 to 12.9	0.10	0.03	0.01	0.01	0.19	0.12	0.15	0.09
13.0 to 13.9	0.06	0.01	0.00 ⁺	0.00 ⁺	0.14	0.04	0.09	0.06
14.0 to 14.9	0.02	0.00 ⁺			0.07	0.02	0.04	0.03
15.0 to 15.9	0.01	0.00 ⁺			0.02	0.01	0.01	0.02
16.0 to 16.9	0.00 ⁺	0.00 ⁺			0.01	0.01	0.00 ⁺	0.01
17.0 to 17.9	0.00 ⁺	0.00 ⁺			0.00 ⁺	0.00 ⁺	0.00 ⁺	0.00 ⁺
18.0 to 18.9	0.00 ⁺				0.00 ⁺	0.00 ⁺	0.00 ⁺	
19.0 to 19.9	0.00 ⁺				0.00 ⁺	0.00 ⁺	0.00 ⁺	
> 19.9	0.00 ⁺				0.00 ⁺			

* A negative value indicates a fall in temperature; a positive value a rise in temperature.

0.00⁺ is less than 0.005 per cent but greater than zero.

Table 3.2(a) Percentage frequency of 6-hourly temperature rises of 10.0 °C or more, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
6-hours ended (GMT)								
0								
1								
2								
3								
4				0.5				0.1
5				0.5				0.1
6				0.5				
7				0.5		0.1		
8				1.0	0.3	0.1		
9	0.2	0.5		1.0	3.6	0.2	0.9	1.9
10	4.5	5.1	7.1	7.6	13.9	7.5	9.0	11.8
11	19.5	22.7	27.6	24.3	24.9	23.5	20.8	23.1
12	28.5	31.6	35.2	29.3	24.4	30.1	24.7	27.2
13	25.6	25.2	19.4	22.7	17.6	23.5	22.7	20.2
14	15.2	10.3	9.2	11.1	10.8	10.9	13.9	11.3
15	5.4	4.4	1.5	1.0	3.7	3.4	6.2	3.4
16	1.1	0.2			0.7	0.7	1.6	0.5
17					0.1		0.2	0.1
18								0.1
19								0.1
20								
21								
22								
23								
No. of occasions	1129	409	196	198	1515	1198	1205	878

Table 3.2(b) Percentage frequency of 6-hourly temperature falls of 10.0 °C or more, 1961–75

6-hours ended (GMT)	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
0	26.3	27.2	18.4		22.9	19.2	24.1	22.6
1	13.2	9.1	15.8		14.7	6.7	7.1	12.5
2	5.3				5.5		0.9	3.0
3					1.8	0.8		0.6
4					0.8	0.8		
5					0.3			0.6
6					0.3			0.6
7					0.3			
8					0.2			
9					0.2			
10								
11								
12								
13								
14								
15								
16								
17						0.8		
18			2.6			0.8	0.5	
19	2.6				0.3	0.8	0.9	1.2
20	2.6	9.1	13.2		2.0	6.7	3.6	4.8
21	2.6	9.1	13.2	33.3	9.6	11.7	7.1	13.7
22	21.1	27.3	21.0	33.4	16.9	26.7	27.2	17.8
23	26.3	18.2	15.8	33.3	24.2	25.0	28.6	22.6
No. of occasions	38	11	38	3	396	120	224	168

Table 3.3 (a) Percentage frequency of monthly values of 6-hourly temperature rise of 10.0 °C or more, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
January			0.5	1.0	0.3		0.5	0.1
February	1.3	2.2	1.0	1.5	1.0	0.7	1.8	4.8
March	13.7	12.7	20.9	13.6	11.3	12.6	8.2	7.6
April	10.7	17.6	6.6	7.6	8.8	11.4	9.1	13.1
May	12.1	12.2	9.2	11.6	12.5	10.8	15.1	11.0
June	15.3	18.4	12.3	7.6	15.2	13.9	17.3	13.0
July	7.8	5.1	11.2	6.6	9.6	11.3	9.1	10.5
August	13.2	12.0	19.4	5.1	14.3	14.6	14.8	13.8
September	16.3	13.9	13.8	22.2	15.1	16.1	14.3	13.8
October	9.1	4.9	4.6	13.6	10.1	7.9	7.8	9.7
November	0.4		0.5	5.6	1.4	0.5	1.5	1.7
December		1.0		4.0	0.4	0.2	0.3	0.9
No. of occasions	1129	409	196	198	1515	1198	1205	878

Table 3.3 (b) Percentage frequency of monthly values of 6-hourly temperature falls of 10.0 °C or more, 1961–75

	London	Manchester	Cardiff	Plymouth	Birmingham	Boscombe Down	Leeming	Edinburgh
January					0.2			1.2
February					0.2		2.2	7.1
March	21.0	18.2	5.2	66.7	7.1	15.8	6.7	4.2
April	2.6	9.1	5.3		6.1	4.2	4.5	8.9
May	23.7	27.2	7.9		9.1	8.3	18.7	10.7
June	23.7	18.2	31.6		23.0	24.2	29.0	17.3
July	10.5	9.1	26.3	33.3	8.1	20.0	13.4	17.9
August	5.3	18.2	21.0		15.4	15.8	14.7	9.5
September	7.9				18.2	1.7	7.6	13.7
October	5.3				12.1	6.7	1.8	8.3
November			2.7		0.5	3.3	0.9	1.2
December							0.5	
No. of occasions	38	11	38	3	396	120	224	168

Table 3.4 Extreme 6-hourly changes in temperature, 1961-75

		Date	From Time GMT	Temp. ° C	To Time GMT	Temp. ° C	Temperature difference ° C	Remarks
London								
Rise	29/3/65	08	1.7	14	21.7	20.0	Heating after cold, clear night.	
Fall	8-9/5/70	18	22.0	00	9.4	-12.6	Slack low pressure area. Thunderstorm 18 GMT.	
Manchester								
Rise	29/3/65	07	3.6	13	21.1	17.5	Heating after cold, clear night.	
Fall	29/8/61	16	28.8	22	17.8	-11.0	Cold front crossing station from W.	
Cardiff								
Rise	23/3/73	07	0.8	13	14.4	13.6	SW'ly gradient. Warm sector.	
Fall	7/8/75	16	28.0	22	15.9	-12.1	Trough from low over western France.	
Plymouth								
Rise	7/10/71	07	3.6	13	17.0	13.4	Ridge. Heating after clear night.	
Fall	7/3/69	16	11.8	22	1.4	-10.4	Cooling after warm day.	
Birmingham								
Rise	29/3/65	06	-1.7	12	19.4	21.1	Heating after cold, clear night.	
Fall	29/3/65	16	21.2	22	5.4	-15.8	Cooling after warm day.	
Boscombe Down								
Rise	29/3/65	07	-0.4	13	19.1	19.5	Heating after cold, clear night.	
Fall	28/3/65	15	20.4	21	6.7	-13.7	Cooling after warm day.	
Dishforth/Leeming								
Rise	29/3/65	06	0.7	12	20.5	19.8	Heating after cold, clear night.	
Fall	29/3/65	16	23.0	22	8.7	-14.3	Cooling after warm day.	
Edinburgh								
Rise	1/5/66	06	3.8	12	21.1	17.3	Heating after cold, clear night.	
Fall	20/7/72	15	28.1	21	13.4	-14.7	Wind change from 280 ° to 040 °	

