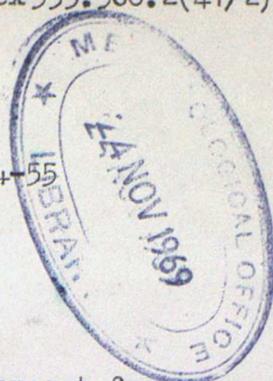


METEOROLOGICAL OFFICE

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A COMPARISON OF THE WINTERS OF 1946-47 AND 1954-55

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General character of the weather during the preceding months.

Dull wet months preceded both winters. In England and Wales, except for October 1946, every month from May to October in both years had more than average rainfall. The sequence was similar in Scotland and Northern Ireland except that the series of wet months began in June. Both years had less than average sunshine. There were four consecutive dull months in England and Wales during each year; May-August in 1954 and August-November in 1946. In Scotland and Northern Ireland, although the sunshine was slightly above the average during August 1946 and September 1954 every other month from June to November showed a deficit. Severe and destructive gales occurred during the autumn of both years, and both winters were preceded by an unusually mild period when the mean temperature of the month immediately before the onset of the cold weather - November in 1946 and December in 1954 - was as much as $3\frac{1}{2}^{\circ}\text{F}$. above the monthly normal.

Synoptic development leading to the cold weather.

During the first half of November 1954 Atlantic depressions crossed north-west Europe and entered northern Siberia with little obstruction. Later in the month, an anticyclone from the region of the Azores remained stationary over the southern part of the British Isles for a few days before moving east and north-east to amalgamate with another anticyclone which in the meantime had been developing over northern Russia. The nucleus of a 'blocking high' was thus formed, and from then on an anticyclone persisted almost without interruption until December 5, although its centre drifted west and south and was sometimes in central and sometimes in southern Siberia. It was not until another anticyclone had moved across France north-eastwards into southern Norway however, that on December 31 a link was established with the Siberian anticyclone by which cold surface air over southern Russia was brought over the British Isles.

The synoptic development leading to the wintry weather of 1946-7 has been described elsewhere by C.K.M. Douglas (1), but it is worthy of note that an anticyclone which formed over Russia during the latter part of November 1946, later moved into southern Siberia as it increased in intensity, and gave rise to a sweep of westerly winds right across the northern plains of Asia. This situation, as in 1954, allowed the free passage of a series of depressions from north-west Europe into northern Siberia. These depressions became slow moving as their path became progressively blocked by the northward movement of the Siberian anticyclone, and probably owing to their momentum increased in intensity, thus giving rise to the severe gales of the autumn. A similar type of blocking action probably also caused the very rough weather during the latter part of 1954 and may have accounted for the mild air being drawn up from the south and south-west over the British Isles immediately before the onset of the cold weather of both winters. In this connection it may also be mentioned that the exceptionally cold winter of 1942, which set in at the end of December, was preceded by a spell of mild weather with pressure gradient steeper than the average and frequent gales in Scotland; during that autumn a mean hourly wind speed of 52 kt. was registered at Stornoway on December 6 and one of 50 kt. at Lerwick on December 7. The winter of 1943 on the other hand was mild and was preceded by a quiet November with temperature somewhat lower than normal. Reverting to 1947, it was not until December 5 when the Siberian anticyclone had moved sufficiently far north that easterly winds were brought into Europe. These easterlies even encroached as far west as the British Isles on December 15, but the first cold spell was short-lived and sustained wintry conditions did not commence until more than a month later.

70 Days 3a

Synoptic development during the winters.

The synoptic development during the cold weather of each year was very different.

In 1955, the first burst of easterly winds following the movement of an anticyclone from northern France to southern Norway, lasted about a week. These were followed after a short milder spell, on January 11, by an influx of arctic air from the north. Winds continued from a general northerly direction until January 18 when they backed to south-west as troughs and secondary depressions brought milder weather from the Atlantic across the country. On February 9, cold northerly winds again swept south over the British Isles, and although they veered towards the east on the 20th, the air reaching this country was, for some time, largely of arctic origin. An anticyclone over Poland maintained an easterly airstream over much of western Europe, including the British Isles during the first few days of March, but another system of high pressure developed off the west of Ireland on March 4 and winds again backed towards the north. On March 10 this new anticyclone commenced to move towards Scotland gradually re-establishing an easterly continental airstream. For the next two weeks weather was mainly dry, cold and sunny with wind varying between east and north until an influx of milder air from the south-west on March 23 brought the winter to an end.

In 1947 the winter really began on January 18 when an anticyclone over southern England moved northward, as in 1955, to the Norwegian coast and cold easterly winds brought air from the coastal regions of northern Russia into the country. This anticyclone soon became an extension of the large Siberian anticyclone whose central pressure was then as high as 1060 mbs. By January 29 a trough separated the Siberian and Scandinavian anticyclones again, but the latter developed a ridge across northern England to join with a third high pressure system situated south of Greenland. Easterly winds were maintained throughout February and depressions approaching from the Atlantic passed to the south of the British Isles into the continent. Towards the end of the month a great sweep of easterly winds was being maintained for thousands of miles from Arctic Russia to the Hudson Bay. The cold weather was eventually brought to an end on March 16 by a deep depression which developed over our south-west coasts with severe gales.

The essential difference in the synoptic development between the two winters seems to have been that in 1955 cold continental air never became firmly established over the British Isles for any length of time, but throughout the winter winds repeatedly backed from east to north bringing over alternately air of continental and arctic origin, whereas in 1947 steady and bitter easterly winds were maintained by a continental airstream practically throughout the winter.

Duration of the cold weather.

In 1955, the easterlies which brought the first severe weather of the winter broke through to the British Isles on New Year's Day following an unusually mild December. The wintry conditions continued throughout the major part of the first three months of the year except for two weeks of milder weather extending over the end of January and beginning of February. The winter ended with four abnormally wet days - March 23-26 - as depressions brought mild Atlantic air from the south-west.

There were cold spells from December 15-20 1946 and January 5-7 1947, both due to the eastward movement of the Russian anticyclone, but these were followed by a spell of unusual mildness from January 8-17. The sustained wintry weather of 1947 was delayed until January 18 and was thereafter maintained by a prolonged period of easterly winds lasting seven and a half consecutive weeks until it was finally brought to an end on March 16 by the spread of milder air northwards. Unprecedented floods occurred in England and Wales during the latter part of March as the winter snows melted.

The winter of 1947 was therefore longer than that of 1955 if the first two cold spells are included, and was remarkable for an exceptionally long unbroken period of bitterly cold weather, whereas the longest period of unbroken wintry

weather in 1955 lasted only about three weeks.

Snowfall during the periods January to March.

With the more prevailing north-easterly winds of 1955, the worst snowfalls were in north and east Scotland and north-east England, but in 1947 heavier snow in the south and midlands was often associated with warm air of depressions to the south of the British Isles over-running the cold easterlies. A detailed account of the various snowstorms during each winter has been given elsewhere by C.K.M. Douglas (1) and the present writer (2). The maps reproduced here give the number of days of snow falling and snow lying in each case, and for comparative purposes embrace the first three months of each year.

It may be seen from Fig.I that from January - March 1955 snow fell on at least 30 days over most of Scotland and England north of about 53°N, except in the west, and for 30 days also over Shropshire, Monmouthshire, south-east Denbighshire, Warwickshire, the south Midlands, Suffolk, most of Norfolk and parts of the London area and the North Downs. It fell for more than 45 days in north-east Scotland and locally in Cumberland, Northumberland and Durham, but for less than 15 days locally in the Isle of Wight, along the south-west coast of England and in western Scotland between the Firth of Clyde and the Firth of Lorne.

During the same three months in 1947 (see Fig.II) snow fell for more than 60 days in Scotland south of the Caledonian Canal, in the Pennines and in North Wales, and for more than 75 days in the Grampians. It fell for less than 45 days in the London region and the Thames Estuary, along the south coast, south-west of an approximate line Southampton to Bristol, along the south and west coast of Wales, west of an approximate line Dumfries to Oban and north of the Caledonian Canal.

Coastal areas apart, it will be seen that snow fell nearly twice as frequently during the first three months of 1947 as during the corresponding months of 1955, except north of the Caledonian Canal.

Fig.III shows the duration of snow-cover during the period January - March 1955. Snow lay on the ground for 30 days over most of Scotland and England north of 53°N, (except in the extreme west,) and the valleys of the Tees, Humber and Mersey, over most of Wales, the west and south Midlands, (except the Severn and Avon Valleys,) Bedfordshire and Hertfordshire. It lay for more than 60 days in the region of the Cairngorm mountains, Scotland, and locally in Northumberland and Durham, and for less than 15 days in the Thames Valley, south-west of an approximate line Eastbourne to Bristol, (except locally in Wiltshire, Devonshire and Somerset,) along the Welsh coast, Solway Firth and the Firth of Clyde.

If Figs I and III are compared it will be seen that, during 1955 at least, the duration of snow cover was related very closely to the number of days snow fell in a particular area.

During this period in 1947, Fig.IV shows that snow lay on the ground for at least 30 days over Sutherland and Caithness and over most of the remainder of Scotland south of the Caledonian Canal except near the coasts and along a corridor from the Firth of Forth through Stirling and Renfrew to the Western Isles. Most of England and Wales was snow-covered for a similar length of time north and west of an approximate line from Dungeness to Swansea and northward to Llandudno except in west Essex, Hertfordshire and Bedfordshire. Snow lay for more than 45 days in the Cairngorm mountains, Peebles and Selkirk in Scotland, and also in parts of Lincolnshire, the west Riding of Yorkshire, the Peak district and Denbighshire in England and Wales. Only in the extreme south-west of Cornwall was the ground snow-covered for less than 15 days.

In Scotland and north-east England snow lay on the ground considerably longer in 1955 than in 1947. Elsewhere the duration of snow cover was slightly longer in 1947 than in 1955.

District Values of Temperature

District	1954-55				
	Nov.	Dec.	Jan.	Feb.	Mar.
0	-0.5	+1.0	-3.7	-6.4	-2.3
1	-0.1	+2.0	-3.0	-6.1	-3.2
2	+0.3	+3.3	-2.4	-5.7	-4.7
3	+1.2	+3.7	-2.7	-4.5	-4.6
4	+0.9	+4.1	-2.5	-5.1	-5.1
5	+1.6	+4.0	-2.1	-3.8	-4.8
6	+0.2	+2.6	-2.7	-5.3	-3.5
7	+0.6	+3.7	-2.2	-5.4	-4.7
8	+0.9	+3.4	-1.9	-4.9	-5.2

1946-47					District
Nov.	Dec.	Jan.	Feb.	Mar.	
+1.4	-1.0	-1.4	-7.7	(-5.6)	0
+2.4	-1.5	-1.5	-8.6	-5.9	1
+3.1	-1.3	-2.8	-8.8	(-5.3)	2
+3.1	-3.2	-4.5	-11.0	-3.1	3
+3.8	-2.3	-4.0	-11.1	-3.8	4
+3.4	-3.7	-3.9	-10.3	-2.6	5
+2.5	-2.0	-2.3	-8.8	-5.7	6
+3.3	-2.2	-3.8	-10.0	-4.1	7
+4.1	-2.6	-3.3	-10.1	-2.1	8

E.W	+0.9	+3.7	-2.3	-4.9	-4.9
S	-0.1	+1.9	-3.1	-5.9	-3.0
NI	-0.6	+3.2	-3.0	-6.1	-3.9

+3.5	-2.5	-3.7	-10.2	-3.5	E.W
+2.1	-1.5	-1.7	-8.4	(-5.7)	S
+2.3	-2.2	-2.5	-8.5	-4.5	NI

E.W = England & Wales.

S = Scotland.

NI = Northern Ireland.

Absolute Highest and Lowest Temperatures

District	1954-55									
	Nov.		Dec.		Jan.		Feb.		Mar.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0	55	19	57	15	54	-5	51	-7	54	9
1	60	18	59	12	58	-5	51	-3	57	9
2	61	21	60	18	54	5	50	-1	58	12
3	61	23	59	20	56	4	54	8	62	11
4	61	21	61	21	55	4	57	0	60	15
5	64	23	59	21	55	7	57	7	65	15
6	58	20	59	19	55	4	55	4	56	14
7	64	21	62	17	57	4	57	3	56	10
8	62	25	61	23	56	14	59	13	61	15

1946-47										District	
Nov.		Dec.		Jan.		Feb.		Mar.			
	Max.	Min.									
-	-	54	18	55	18	43	5	59	1	0	
69	16	54	15	55	8	43	-2	57	-6	1	
68	28	50	19	56	9	44	2	58	-6	2	
67	27	51	8	57	-5	43	-5	59	5	3	
69	29	52	11	57	6	44	-2	59	1	4	
67	27	54	8	56	-6	45	-2	60	7	5	
65	23	52	18	56	9	42	2	55	4	6	
71	30	55	18	57	6	45	-3	59	0	7	
68	29	55	15	56	8	52	1	60	2	8	

Temperature.

The tables above give the difference from average and the maximum and minimum temperatures in eight districts of the British Isles; the division is the same as that used in the Monthly Weather Report. In this scheme district 0 includes Inverness-shire and the northern counties of Scotland, district 4 the English Midlands including the West Riding of Yorkshire and district 5 the south and south-eastern counties south of the Thames Estuary from Wiltshire to Kent. Of the remaining districts 1, 2 and 3 are on the east side of Britain and 6, 7 and 8 on the west side: district 1, the eastern counties of Scotland; district 2, from the Scottish border to Lincolnshire; district 3, East Anglia; district 6, the western counties of Scotland south of Inverness-shire; district 7, the western counties from the Scottish border to central Wales and district 8 includes the Welsh counties south of Montgomery, Somerset and the south-west peninsular. The difference from average temperature is the average departure of the monthly means of four or five representative stations in each district from their long-period (usually 30 years) mean value. The 'highest and lowest temperatures' include the extreme monthly maximum or minimum temperature reported by an officially accredited station in any particular district.

It will be seen that February was the coldest month each winter and that February 1947 was by far the colder February, particularly in England and Wales.

In 1955, February was colder in Scotland than in England and Wales but still not as cold as in either country in 1947, nor was any individual district colder during February 1955 than during February 1947 although January was colder in Scotland during 1955 than during 1947. Extreme temperatures were lower in Scotland during both January and February 1955 than during the same months in 1947 but higher in England and Wales. December was mild during 1954 with temperatures everywhere above the average whereas December 1946 was cold particularly in east and south-east England; March on the other hand was colder in England and Wales during 1955 than 1947, but not so cold in Scotland.

On January 25th 1947 temperature failed to exceed freezing point in most parts of east and south-east England. Thereafter, continuous frost, day and night, became gradually more intense and more widespread, until by the end of the month temperature remained below 32°F throughout the 24 hours almost everywhere in the British Isles. There was a prolonged spell from February 11-23 when temperature was continuously below 32°F in many parts of England and Wales. This period of well over 300 hours is well in excess of any such similar period during 1955. Towards the end of the third week in January 1955 day temperatures rose little above freezing point in many areas of England and Wales, and some very low temperatures were recorded in Scotland but there was no comparable period of continuous frost. During February 1947 at Greenwich mean maximum temperature was the lowest for any month since records began in 1841.

Sunshine.

The following table gives the sunshine in each of the districts mentioned in the preceding section for the first three months of each year expressed as a percentage of the average.

District	1947			1955		
	January	February	March	January	February	March
0	-	146	104	127	165	100
1	87	77	100	101	114	109
2	91	61	67	88	116	130
3	127	36	57	70	117	124
4	94	40	64	80	126	132
5	116	35	57	63	124	128
6	89	120	82	117	148	139
7	100	68	64	92	130	146
8	92	40	57	66	119	143

It will be noticed that January was sunnier in 1947 than in 1955 generally and that in England and Wales there was considerably less sunshine during February and March 1947 than during the corresponding months of 1955. In England and Wales February 1947 was exceptionally dull, sunshine being only 40 per cent or less of the average almost everywhere except in the north-west. At stations with long records as far apart as Falmouth, Kew and Aberdeen it was the dullest February ever known. A number of stations also reported their longest run of sunless days during the month; at Kew there was no sunshine from 2nd to 23rd inclusive, and one or two stations in the London area reported a daily mean of only 0.30 hr. February 1955 on the other hand was a sunny month with sunshine in each district well above the average, particularly in Scotland where parts of north and west Scotland had double the usual amount of sunshine. A similar difference in England and Wales between the two years persisted into March; 1947 was dull though not so dull as February and in 1955 March was even sunnier than the previous month. During January in England and Wales 1947 was the sunnier year.

The winters of 1946-47 and 1954-55 were typical of winters in the British Isles which are dominated by continental and arctic airstreams respectively, and the

general weather experienced was characteristic of the conditions which might be expected when air from such differing source regions arrives over the British Isles during the winter months. In 1947, the persistent, very stable, continental airstream for such a long period, which had been comparatively rapidly cooled from below, led to the protracted dull weather in the east, Midlands and south of England, the long freezing periods in these regions, the consistently low, rather than extreme, and variable temperatures and the heavy snow in England rather than in Scotland. In 1955, winds alternated between east and north, the air supply coming first from the continent and then from the polar regions, the latter predominating. The general airstream was therefore much less stable and less constant but from a more northerly direction which led to more and longer breaks in the cloud, more sunshine during the day and more severe frosts at night and the coldest weather and most snow occurring in the north of Scotland.

(1) C. K. M. Douglas. 'The Severe Winter of 1946-7' Met. Mag. March 1947 Vol.76

(2) R. E. Booth. 'The Snow of January and February 1955' Vol.84 1955 pp. 129-137

NUMBER OF DAYS SNOW
FALLING AT STATION
JANUARY-MARCH 1955
ISOPLETHS
EVERY 15 DAYS

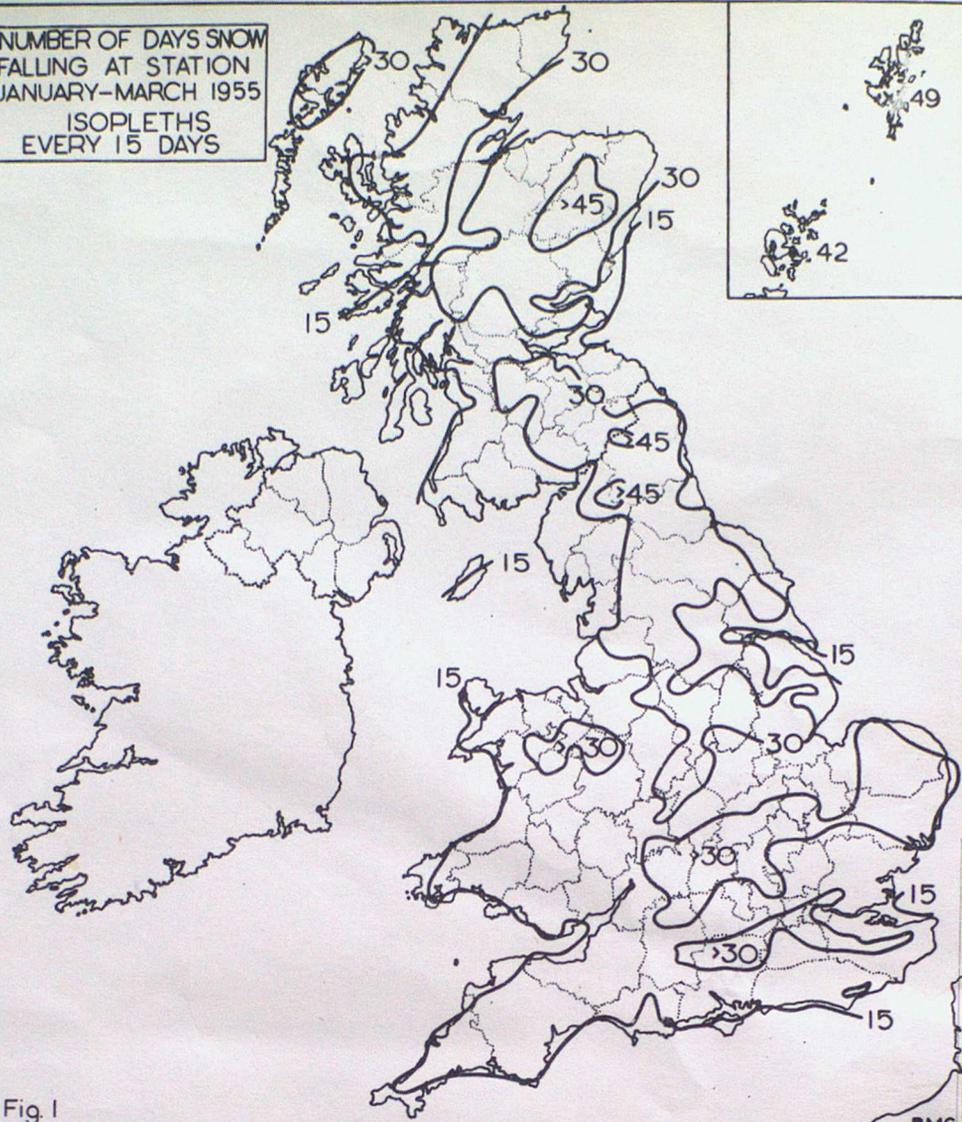


Fig. 1

NUMBER OF DAYS SNOW
FALLING AT STATION
JANUARY-MARCH 1947
ISOPLETHS
EVERY 15 DAYS

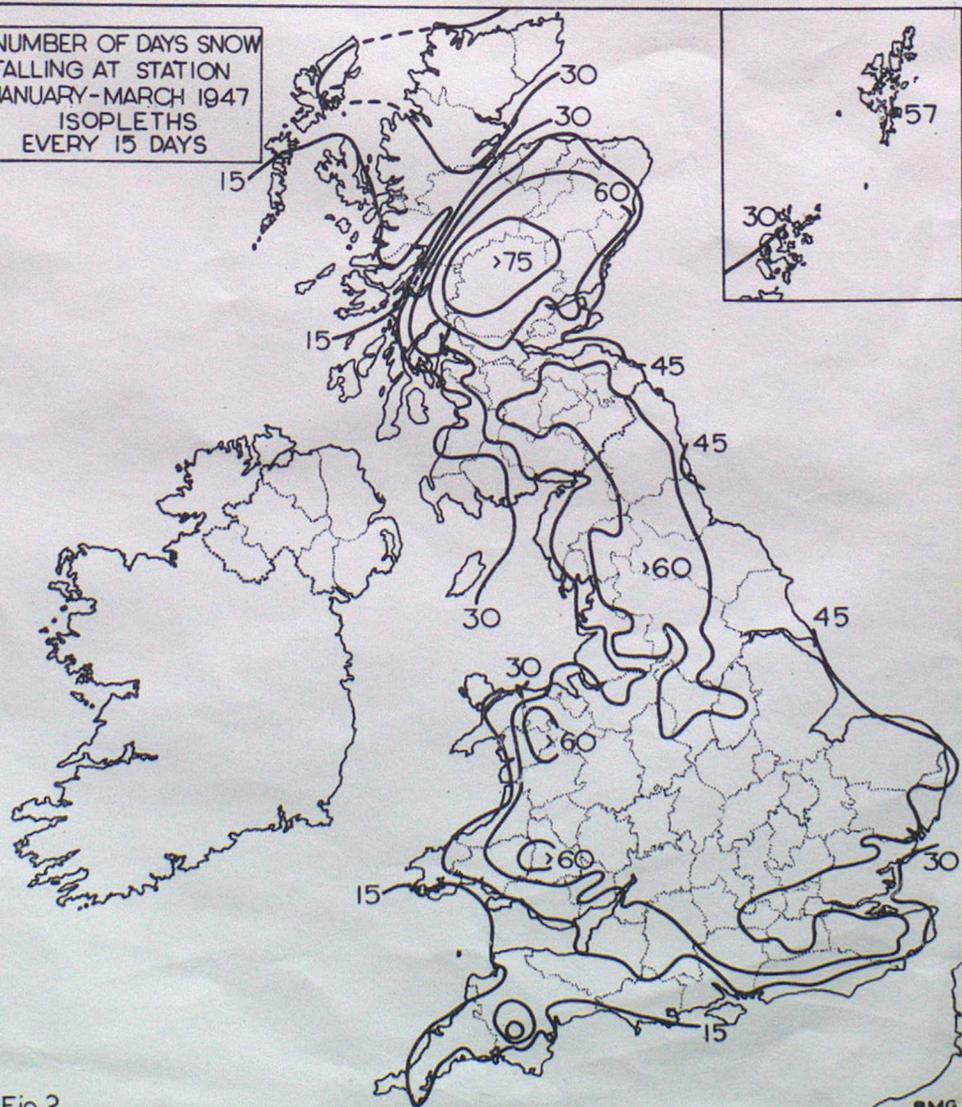


Fig. 2

