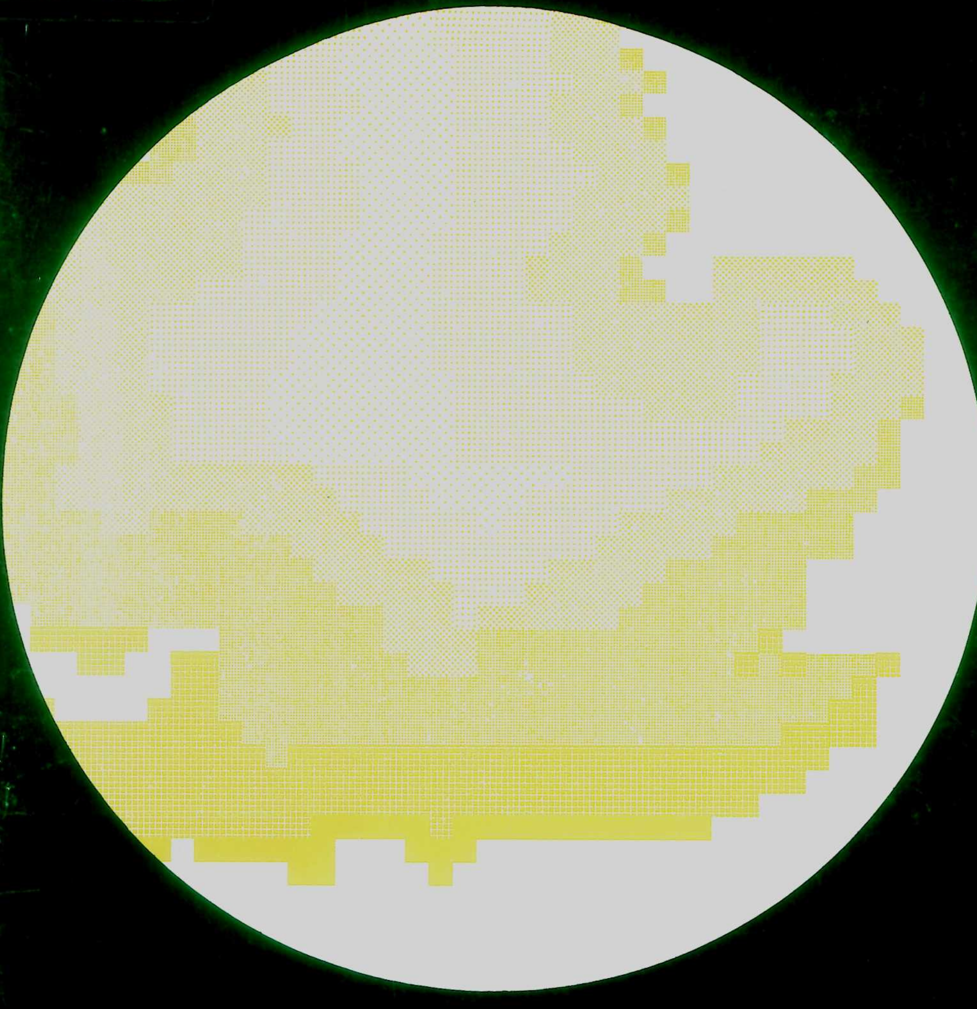
Climatological Maps of Great Britain



Institute of Terrestrial Ecology
Natural Environment Research Council

ERRATA

p3	Third line from bottom: the constant -10.38 should be -10.83.
p10	Equation for mean duration of bright sunshine: the coefficient 0.00174 should be -0.00174.
p12	Equation for mean duration of bright sunshine: the coefficient 0.00330 should be -0.00330.
p12	Equation for mean windspeed: the constant -0.00361 should be -0.000361.
p13	Equation for mean duration of bright sunshine: the constant 0.407 should be 4.07.

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Climatological Maps

of

Great Britain

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Institute of Terrestrial Ecology
Bush Estate
Penicuik
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Cover photograph shows part of the map for mean duration of bright sunshine (hours day^{-1}) in January-March

The **Institute of Terrestrial Ecology (ITE)** was established in 1973, from the former Nature Conservancy's research stations and staff, joined later by the Institute of Tree Biology and the Culture Centre of Algae and Protozoa. ITE contributes to, and draws upon, the collective knowledge of the fourteen sister institutes which make up the **Natural Environment Research Council**, spanning all the environmental sciences.

The Institute studies the factors determining the structure, composition and processes of land and freshwater systems, and of individual plant and animal species. It is developing a sounder scientific basis for predicting and modelling environmental trends arising from natural or man-made change. The results of this research are available to those responsible for the protection, management and wise use of our natural resources.

One quarter of ITE's work is research commissioned by customers, such as the Department of Environment, the European Economic Community, the Nature Conservancy Council and the Overseas Development Administration. The remainder is fundamental research supported by NERC.

ITE's expertise is widely used by international organizations in overseas projects and programmes of research.

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C O N T E N T S

INTRODUCTION

It is well known that southern Britain is usually warmer than the north, that lowlands and valleys are warmer than the uplands, and that the west of the country is wetter than the east. These and other differences reflect differences of geographical location, topography and oceanicity, and it would therefore be surprising if average climate could not be predicted for particular locations characterized by an appropriate set of site variables. This booklet gives a set of equations concerned with the prediction of values for:

1. air temperature
2. rainfall
3. visibility
4. duration of bright sunshine
5. windspeed
6. total snow depth

for the 4 quarters of the year, where appropriate. It also gives a parallel set of climate maps derived from these equations and based on observations made at 68 meteorological stations. These maps have many uses, none more important than the identification of weather affecting plant and animal performance at different locations.

METHODS

The equations, which were derived from multiple regression analyses, relate site variables (Table 1) to the different aspects of weather, using quarterly data (January-March, April-June, July-September and October-December) for the period from 1960 to 1969 inclusive. Subsequently, the maps were drawn from predictions made for points at 10 x 10 km intervals for England, Scotland and Wales.

In selecting climatic variables, the choice was influenced by the wish to relate plant and animal performance to climate. For instance, mean windspeeds have been predicted instead of number of days with gale-force winds, because mean windspeed has greater significance for grazing animals than the occurrence of relatively rare winds of gale force.

RESULTS AND DISCUSSION

Regrettably, most existing climatological stations are in the more densely populated lowlands, with few in the uplands. For this reason, predictions for upland localities may be subject to greater errors than those for lowland sites, but this reservation is not thought to be serious. Whereas Taylor (1976) quoted a lapse rate of mean temperature with elevation of 6°C per 1000 m, the equations (mostly from White 1979) in Table 2 suggest a lapse rate per 1000 m of 7.6°C, 7.5°C, 7.1°C, and 6.0°C for

January-March, April-June, July-September and October-December, respectively. With this sensitivity to altitude, it is not surprising that the maps of temperature in this booklet differ from older maps (Meteorological Office 1952, 1975; Chandler & Gregory 1976) in which temperatures are only given for sea level. Other instances of altitudinal sensitivity are to be seen in the January-March rainfall map where, for example, heavy rainfall in the Prescelly Hills of south-west Wales is discernible. This sensitivity seems comparable with that in rainfall maps (Meteorological Office 1952; Woodley 1980; ITE 1978) and in the maps by Bendelow and Hartnup (1980) and Birse (1971).

Although the multiple regression equations (Table 2) could doubtless be refined by (i) the use of longer series of data, and (ii) the inclusion of observations from a greater number of upland stations, the predictions now available have been used to prepare a classification of British climate (White 1981) and also to examine the factors governing tree growth (White in press). For the future, the preparation of maps based on site variables for points spaced at intervals of 1 x 1 km may be considered.

THE MAPS

1. Mean air temperature (^{o}C) at 0900 hours GMT in a screen 1.3 m above ground level: January-March, April-June, July-September, and October-December. The data have not been reduced to sea level as in Meteorological Office maps.

2. Mean rainfall (cm day^{-1}): January-March, April-June, July-September and October-December.

3. Mean visibility at 0900 hours GMT (coded 0-9 as in Meteorological Office 1956): January-March, April-June, July-September and October-December - primarily an indicator of the attenuation of sunlight.

4. Mean duration of bright sunshine (hours day^{-1}): January-March, April-June, July-September and October-December. This variable has been predicted because insufficient is known about the intensity of solar radiation.

5. Mean windspeed at 0900 hours GMT (m s^{-1}): January-March, April-June, July-September and October-December - a variable calculated in preference to numbers of days with gale-force winds.

6. Mean total snow depth at 0900 hours GMT (cm): January-March, April-June, and October-December.

Values are indicated of Grid northing (GRIN) on the vertical axis and Grid easting (GRIE) on the horizontal axis, the numbers representing hundreds.

HOW TO USE THE EQUATIONS

1. List Grid References, eastings and westings, of sites for which predictions are required.

2. If few sites are involved, calculations can be made with a pocket calculator. If many sites are involved, use existing computer programs (White 1977), or modifications of them to suit available computers.

3. Decide the aspects of weather for which predictions are required, also the 3-monthly periods of the year.

4. List site variables used in the appropriate predictive equations. To calculate the total snow depth in January-March, only 2 variables, ELEV and SWNE, are required. For other attributes, more variables are involved.

5. Read values of site variables from maps, as described in Table 1.

6. Insert the values, obtained in 5, in the appropriate equations and calculate predictions.

Example: The mean temperature and rainfall, for January-March, are required for Queens Wood, National Grid Reference SO 980 250, using Ordnance Survey 1:50 000 sheet nos 150, 162 and 163.

The equations need the following information:

	Site variables				
	ELEV	SLOS	HOR	DFSE	ELE4
Values read from map	165	-3	220	65	590
Unit	m	degrees	degrees	km	m

Additionally, it is necessary to calculate SWNE and SENW, where GRIE and GRIN read from the margins of the relevant maps are 398 and 225, respectively. Note that the 'hundreds' are only printed in the corners of the different maps; they do not appear in Grid References.

Thus: $\text{SWNE} = (0.0890 \times 398) + (0.0442 \times 225) - 56.2$
$= -10.38$

$\text{SENW} = (-0.0447 \times 398) + (0.0889 \times 225) - 23.8$
$= -21.59$

By substituting the equations in Table 2:

Mean air temperature in January-March

$(-0.00757 \times 165) + (0.0334 \times -3) + (0.00153 \times 220)$

$- (1.63 \times \log_e (-10.83 + 50)) - (0.235 \times \log_e (-21.59 + 50))$

$- (0.106 \times \log_e (65 + 1)) + 11.6$

$= 3.38^{\circ}C$

Mean rainfall in January-March

$(0.000929 \times 398) + (0.000325 \times 165) + (0.0000397 \times 590)$

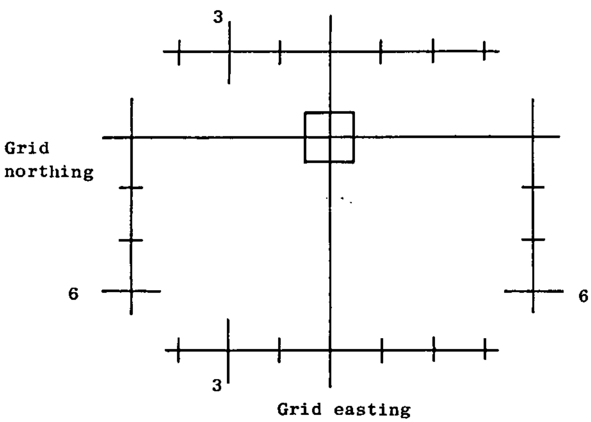
$- (0.467 \times \log_e 398) + 2.56$

$= 0.211$ cm

HOW TO USE THE MAPS

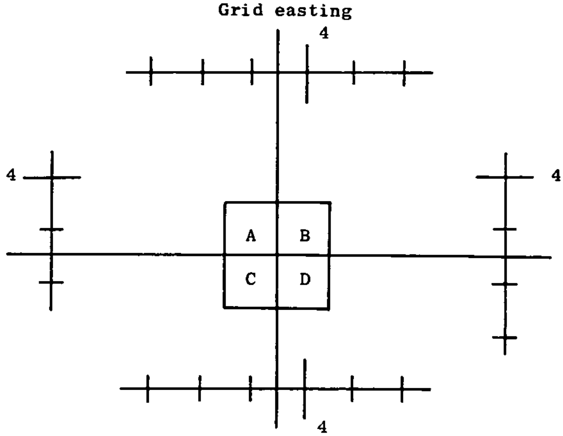
The maps are based on values calculated for locations spaced at 10 x 10 km intervals. Closer spacings could be used, but the greater refinement is of doubtful value.

Example 1: Read the mean rainfall in July-September at a location with GRIE = 320 and GRIN = 630



Turn to the appropriate map. To locate the square in question, place rulers across both vertical, and both horizontal, axes at the relevant easting, GRIE, and northing, GRIN. The rainfall falls within the range 0.30-0.40 cm per day.

Example 2: Read the mean rainfall in July-September for a location with GRIE = 395 and GRIN = 385



Turn to the appropriate map and locate the position in question. As it is at the join of 4 squares, the mean rainfall is likely to be within the range 0.20-0.40 cm, the limits of the rainfall for locations in the centres of each of the 4 abutting squares, A 0.20-0.25 cm; B 0.30-0.40; C 0.25-0.30 cm; and D 0.30-0.40 cm.

ACKNOWLEDGEMENTS

Thanks are given to the Meteorological Office who supplied the original data, the staff of the Edinburgh Regional Computing Centre, where predictions were transformed into maps, and to those who helped by reading values of topographical variables from maps. Also to Mr J N R Jeffers, Professor F T Last and Dr E D Ford for their comments on the text.

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Table 1. Site variables used in predicting different aspects of weather (see Table 2 for equations) for different locations in Great Britain; also methods for obtaining data from maps

Site variable	Comments and procedure for reading values from maps
Grid easting (GRIE)	From 1:63 360 or 1:50 000 scale Ordnance Survey (OS) maps to nearest 1 km.
Grid northing (GRIN)	From 1:63 360 or 1:50 000 OS maps to nearest 1 km.
Distance to sea (DFS)	From the site concerned to the nearest point on the coastline. If this occurs in an estuary, to the nearest point where the sea is 10 km wide. Use 1:625 000 OS maps to nearest 1 km.
Elevation (ELEV)	To nearest 5 m, from 1:63 360 or 1:50 000 OS maps.
Aspect (ASP)	Degrees clockwise from true north, taken for the 1 km square centred on the site, to the nearest 10°. If the area within the square is nearly flat, a wider area is substituted to avoid a zero value, if possible. The aspect is then adjudged to correspond with the direction of the nearest flowing stream or river from the site. Thus, if the nearest stream is to the east, aspect is regarded as to the east, ie 90°, irrespective of the direction in which the stream is flowing.
Slope due east or west (SLOW)	Calculated from the height of 2 points within ½ km east and ½ km west of the site, giving an angle of slope which is representative over this distance. Westerly slopes are regarded as negative, easterly as positive. For example, contour lines of 122 and 152 m OD respectively cross a west-east line at a distance of 400 m; the tangent of the slope = 30:400 = 0.075, implying a slope of -4°, which is negative as the slope is westwards. See footnote and Figure.

Slope to north/ south (SLOS)	As for SLOW above, but slopes to south are negative; those to north are positive.
Change of slope through the site (VERT)	Measures whether the steepest slope passing through the site changes direction: convex ($>180^{\circ}$) forming a dome, or concave ($<180^{\circ}$) as in a basin, to the nearest 10°. See footnote.
Change of direction of contour line passing through the site (HOR)	Measured on the down-slope side. Either an imaginary contour line, or a contour line on the map is used, indicating whether the site is in a valley site ($<180^{\circ}$) or on the brow of a hill ($>180^{\circ}$), to the nearest 10°. See footnote.
The sum of the 4 differences in elevation (m) from the site to the highest, or lowest, location within 10 km, whichever is the larger, the NW, NE, SW and SE quadrants (ELE4)	An expression of the ruggedness of the terrain. Use 1:63 360 or 1:50 000 OS maps. All differences are assumed to be positive. Height differences to the nearest 10 m.
Distance to the sea due west (DFSW)	A measure of oceanity. From 1:625 000 OS maps to the nearest 1 km.
Distance to the sea due east (DFSE)	A measure of the influence of the North Sea. From 1:625 000 OS maps to the nearest 1 km.
Highest elevation at any distance due west (HEW)	Measured in the section $270^{\circ} \pm 2^{\circ}$ true bearing. Use 1:625 000 OS physical maps to nearest 10 m.
Highest elevation at any distance due east (HEE)	Measured in the section $90^{\circ} \pm 2^{\circ}$ true bearing.

The axis, south west-north east, expressing the tilt of the British Isles away from Grid north:

$$\text{SWNE} = 0.0890\ \text{GRIE} + 0.0442\ \text{GRIN} - 56.2.$$

The axis, south east-north west (at right angles to the above):

$$\text{SENW} = -0.0447\ \text{GRIE} + 0.0889\ \text{GRIN} - 23.8.$$

NB In assessing the measures of exposure SLOW, SLOS, VERT and HOR, hills subtending a vertical angle from the horizontal at the site of at least 6° ($\tan > 0.105$) are used. If no hills are large and/or near enough to do this, the local slope is used within a 1 km circle centred on the site. This method is intended to overcome the anomaly of a site on a flat valley bottom surrounded by mountains.

The method was developed on data from climatological station sites of approximately 50 x 50 m, and is suitable for use with sites of this size, which can be taken as points on maps. If predictions are required for larger sites, several points should be taken for each site, to see whether predicted values vary over the site on a large enough scale to be significant for the purpose intended.

Table 2 Equations for predicting different aspects of weather from site variables for Great Britain, showing percentage variation accounted for
1. January-March

Mean air temperature (°C) at 0900 hours GMT in screen 1.3 m above ground 95%

$-0.00757\ \text{ELEV} + 0.0334\ \text{SLOS} + 0.00153\ \text{HOR} - 1.63 \log_e (\text{SWNE} + 50.0) - 0.235 \log_e (\text{SENW} + 50.0) - 0.106 \log_e (\text{DFSE} + 1.0) + 11.6$

Mean rainfall (cm day^{-1}) 66%

$0.000929\ \text{GRIE} + 0.000325\ \text{ELEV} + 0.0000397\ \text{ELE4} - 0.467 \log_e \text{GRIE} + 2.56$

Mean visibility at 0900 hours GMT (coded scale 0-9) 58%

$-0.00207\ \text{HOR} + 0.0353\ \text{SENW} - 0.661 \log_e \text{GRIN} - 0.0776 \log_e (\text{DFSE} + 1.0) + 10.6$

Mean duration of bright sunshine (hours day^{-1}) 73%

$0.00174\ \text{GRIE} - 0.00241\ \text{DFS} - 0.000147\ \text{ELE4} - 0.456 \log_e \text{GRIN} + 0.640 \log_e (\text{SWNE} + 50.0) - 0.0285 \log_e (\text{DFSE} + 1.0) + 3.61$

Mean windspeed at 0900 hours GMT (m s^{-1}) 44%

$0.0575\ \text{SLOS} - 0.000856\ \text{ELE4} + 0.445 \log_e \text{GRIN} - 0.347 \log_e (\text{DFSW} + 1.0) - 0.739 \log_e (\text{DFSE} + 1.0) + 0.436 \log_e (\text{HEE} + 1.0) + 4.94$

Mean total (accumulated) snow depth (cm) **at 0900 hours GMT** 69%

$0.00896\ \text{ELEV} + 0.0206\ \text{SWNE} + 0.327$

If amounts of x, y and z cm of snow fell on only 3 days from January-March, and if none melted and there was no compaction, the mean predicted total snow depth would be $(x + y + z)/90.0$ cm

Table 2 Equations for predicting different aspects of weather from site variables for Great Britain, showing percentage variation accounted for
2. April-June

Mean air temperature (^{o}C) at 0900 hours GMT in screen 1.3 m above ground 93%

-0.00747 ELEV + 0.0226 SLOW − 0.0290 SENW + 0.128 $\log_e$ (DFS + 1.0) + 11.4

Mean rainfall (cm day^{-1}) 65%

0.000433 GRIE + 0.000261 ELEV + 0.000162 HOR + 0.0000171 ELE4 + 0.0000396 HEE − 0.222 $\log_e$ GRIE + 1.28

Mean visibility at 0900 hours GMT (coded scale 0-9) 35%

0.0262 SLOW + 0.0199 SENW − 0.356 $\log_e$ GRIN + 8.71

Mean duration of bright sunshine (hours day^{-1}) 86%

0.0215 SLOS − 0.000188 ELE4 − 0.349 $\log_e$ GRIN
− 0.0738 $\log_e$ (DFS + 1.0) − 0.246 $\log_e$ (SENW + 50.0)
− 0.0786 $\log_e$ (DFSW + 1.0) − 0.0569 $\log_e$ (DFSE + 1.0) + 9.46

Mean windspeed at 0900 hours GMT (m s^{-1}) 27%

0.0602 SLOS − 0.000680 ELE4 − 0.660 $\log_e$ (DFSE + 1.0) + 0.467 $\log_e$ (HEE + 1.0) + 5.27

Mean total (accumulated) snow depth (cm) **at 0900 hours GMT** 66%

0.000854 ELEV + 0.00759 SLOW + 0.0000908 ELE4 − 0.000184 HEE − 0.0129 $\log_e$ (HEW + 1.0) + 0.0238

Table 2 Equations for predicting different aspects of weather from site variables for Great Britain, showing percentage variation accounted for
3. July-September

Mean air temperature (^{o}C) at 0900 hours GMT in screen 1.3 m above ground 96%

-0.00713 ELEV + 0.206 SLOW − 0.0365 SENW − 0.144 $\log_e$ (SENW + 50.0) + 0.0684 $\log_e$ (DFSW + 1.0) + 15.2

Mean rainfall (cm day^{-1}) 67%

0.000321 ELEV − 0.00308 SENW + 0.00000885 HEE − 0.416 $\log_e$ GRIE + 0.285 $\log_e$ (SWNE + 50.0) + 1.59

Mean visibility at 0900 hours GMT (coded scale 0-9) 37%

−0.00209 HOR + 0.0260 SENW − 0.000468 HEE − 0.505 $\log_e$ GRIN + 10.1

Mean duration of bright sunshine (hours day^{-1}) 90%

0.00330 GRIN + 0.0336 SENW − 0.000176 ELE4 − 0.0954 $\log_e$ (DFS + 1.0) − 0.912 $\log_e$ (SENW + 50.0) − 0.0567 $\log_e$ (HEE + 1.0) + 10.3

Mean windspeed at 0900 hours GMT (m s^{-1}) 29%

−0.00361 ELE4 + 0.476 $\log_e$ GRIN + 0.232 $\log_e$ ELEV − 0.274 $\log_e$ (DFSE + 1.0) − 0.214 $\log_e$ (HEW + 1.0) + 2.96

Table 2 Equations for predicting different aspects of weather from site variables for Great Britain, showing percentage variation accounted for

4. October-December

Mean air temperature (^{o}C) at 0900 hours GMT in screen 1.3 m above ground 96%

-0.00598 ELEV + 0.0320 SLOS + 0.00199 HOR − 0.980 $\log_e$ GRIN − 0.203 $\log_e$ (DFS + 1.0) − 0.0787 $\log_e$ (DFSW + 1.0) + 13.3

Mean rainfall (cm day^{-1}) 66%

0.00185 GRIE + 0.000397 ELEV + 0.0000439 ELE4 − 0.000348 DFSW − 0.743 $\log_e$ GRIE + 3.95

Mean visibility at 0900 hours GMT (coded scale 0-9) 70%

-0.00250 HOR + 0.0494 SENW + 0.00335 DFSE − 0.000855 HEW − 0.863 $\log_e$ GRIN + 0.188 $\log_e$ (DFSW + 1.0) − 0.263 $\log_e$ (DFSE + 1.0) + 11.9

Mean duration of bright sunshine (hours day^{-1}) 86%

-0.00159 DFS − 0.000190 ELE4 − 0.216 $\log_e$ GRIN − 0.119 $\log_e$ (SENW + 50.0) − 0.0292 $\log_e$ (DFSE + 1.0) + 0.407

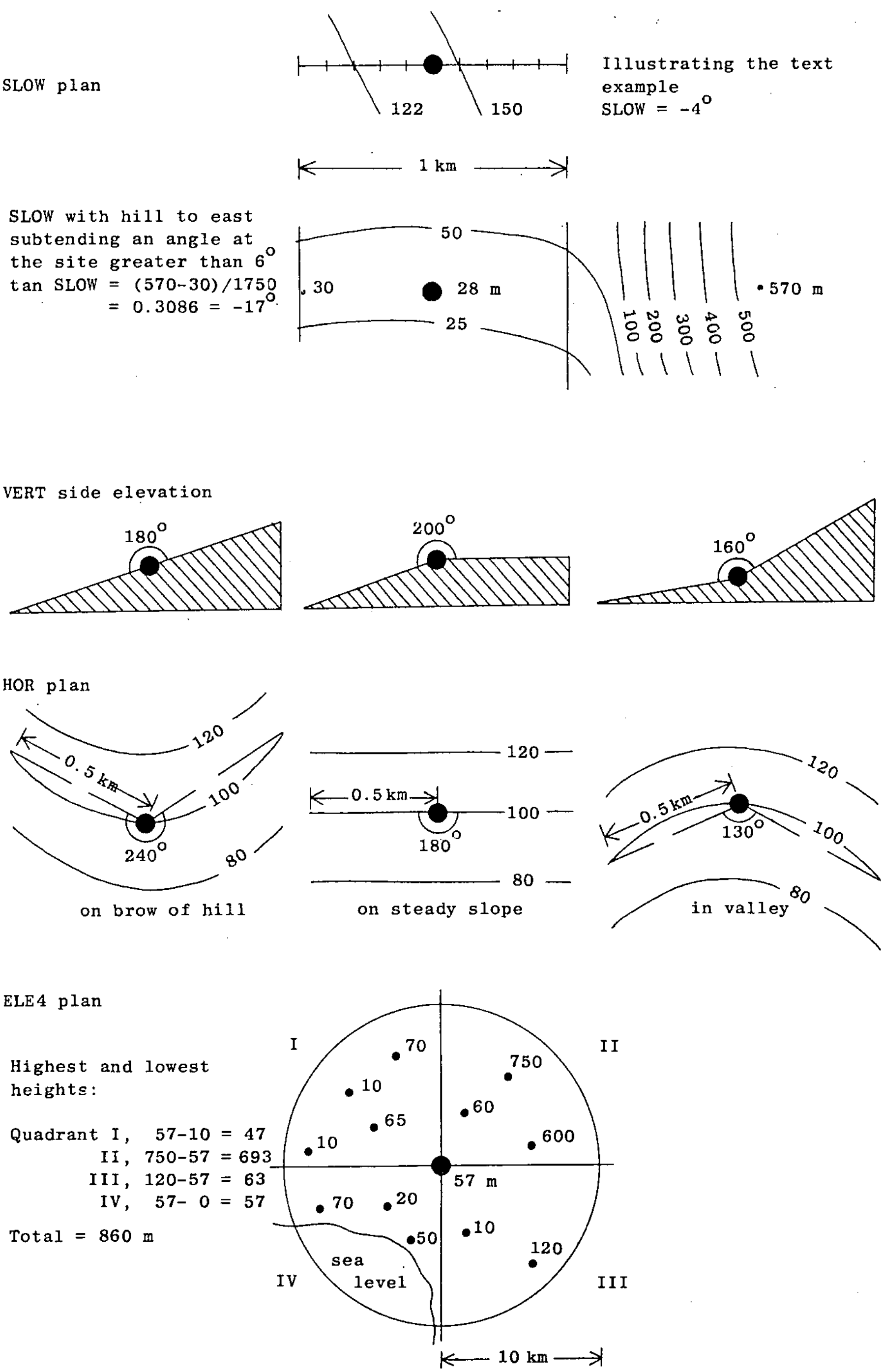
Mean windspeed at 0900 hours GMT (m s^{-1}) 41%

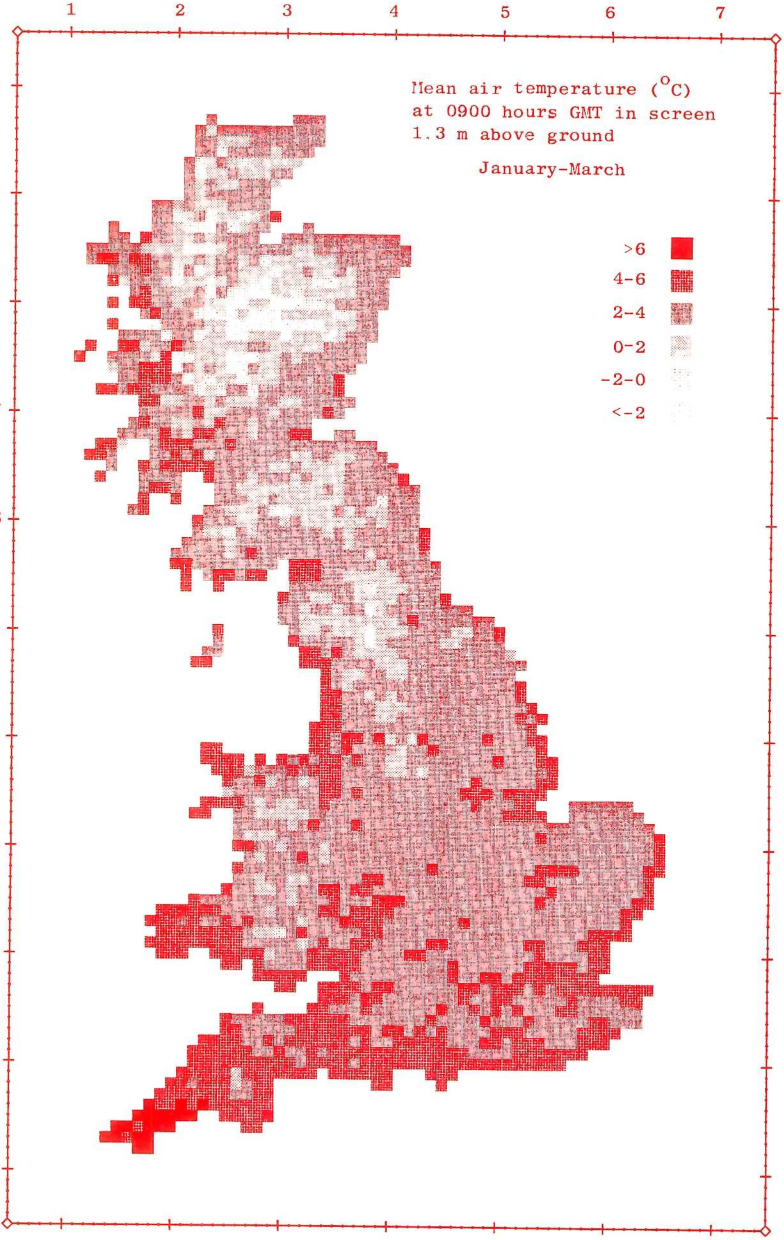
0.00653 DFSW + 0.364 $\log_e$ GRIN + 0.263 $\log_e$ ELEV − 0.838 $\log_e$ (DFSW + 1.0) − 0.322 $\log_e$ (DFSE + 1.0) + 5.07

Mean total (accumulated) snow depth (cm) **at 0900 hours GMT** 80%

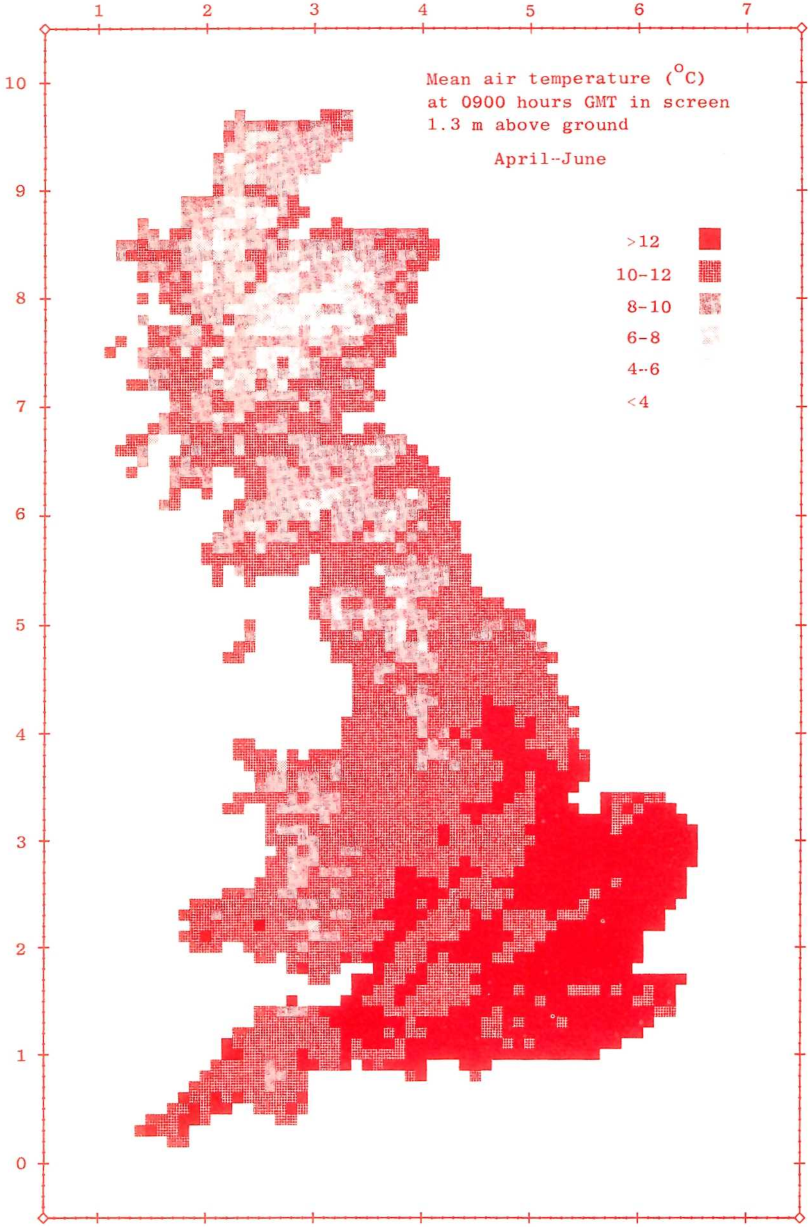
0.000816 GRIN + 0.00360 ELEV − 0.000707 HOR − 0.122 $\log_e$ ELEV − 0.188 $\log_e$ (SENW + 50.0) + 0.876

Figure 1. Examples showing how to read site variables from maps

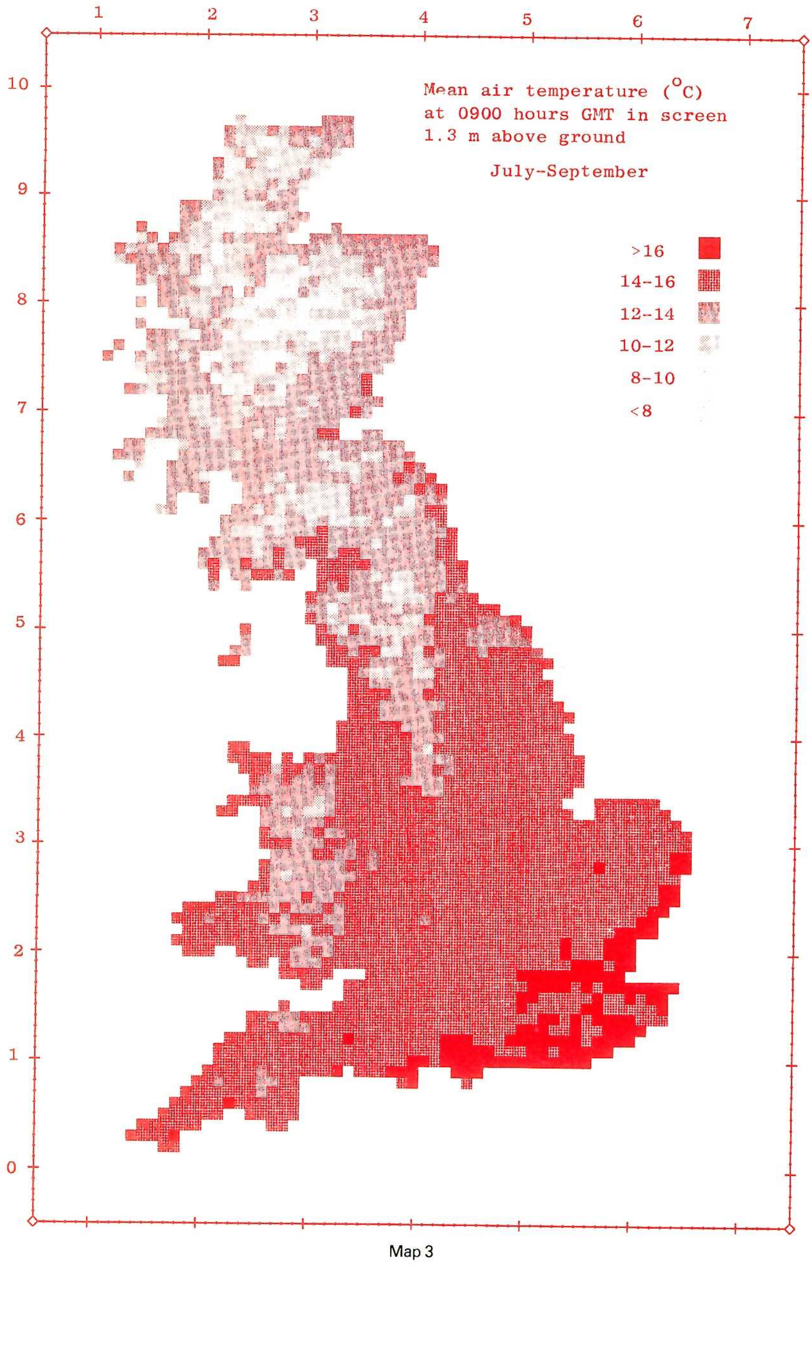



Mean air temperature (°C)
at 0900 hours GMT in screen
1.3 m above ground
January-March
>6
4-6
2-4
0-2
-2-0
<-2
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

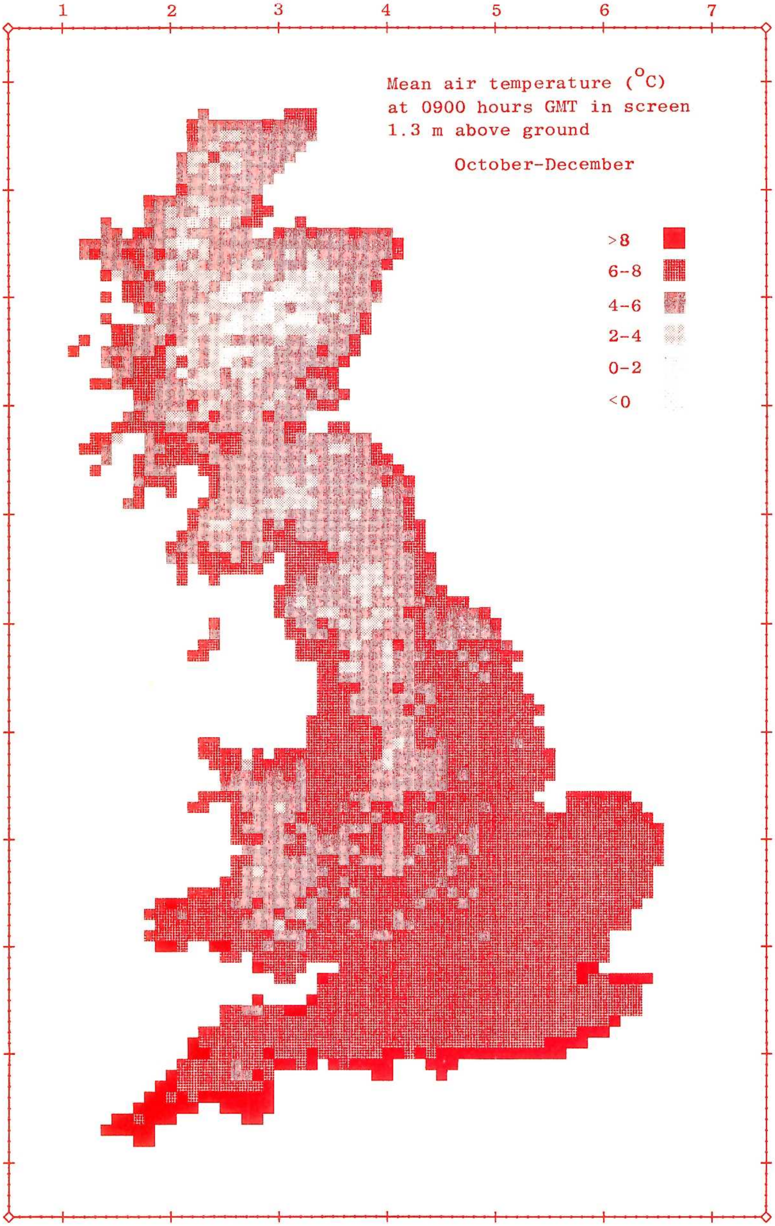
Map 1


Mean air temperature (°C)
at 0900 hours GMT in screen
1.3 m above ground
April–June
>12
10–12
8–10
6–8
4–6
<4
1 2 3 4 5 6 7
0 1 2 3 4 5 6 7 8 9 10

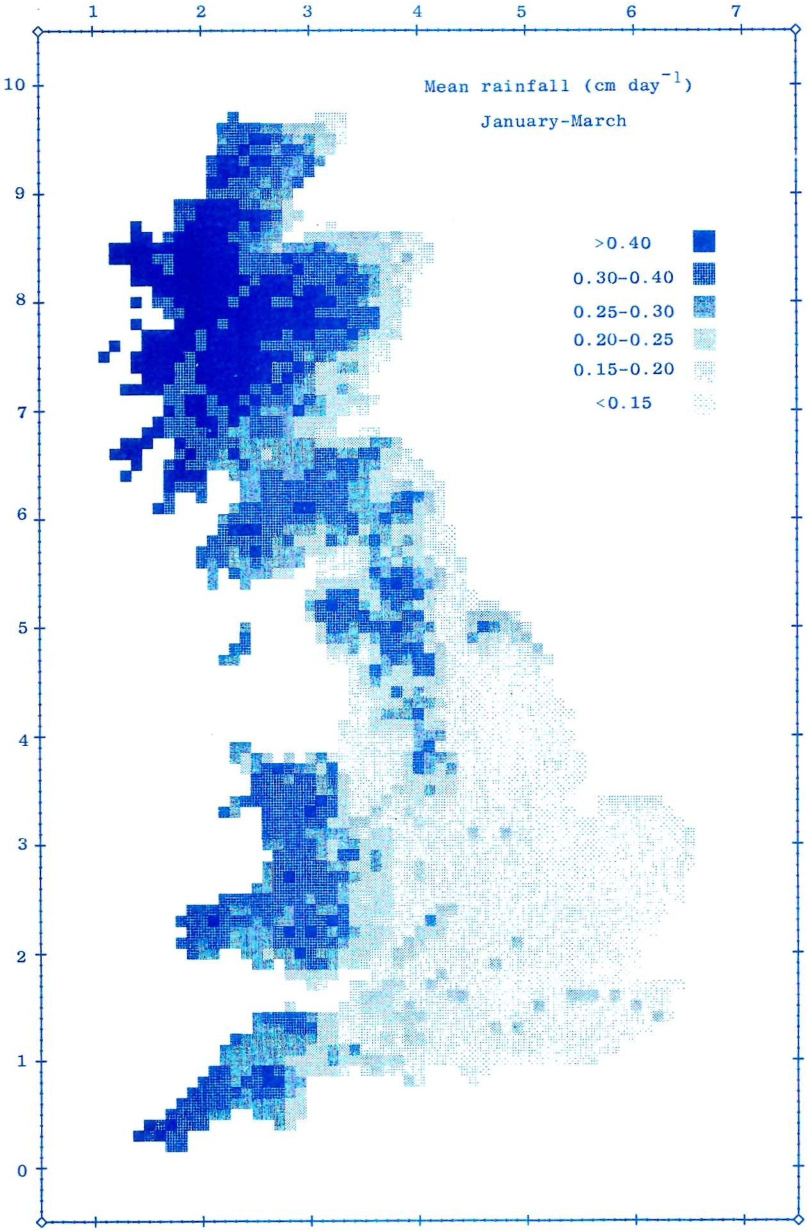
Map 2


1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0
Mean air temperature (°C)
at 0900 hours GMT in screen
1.3 m above ground
July-September
>16
14-16
12-14
10-12
8-10
<8

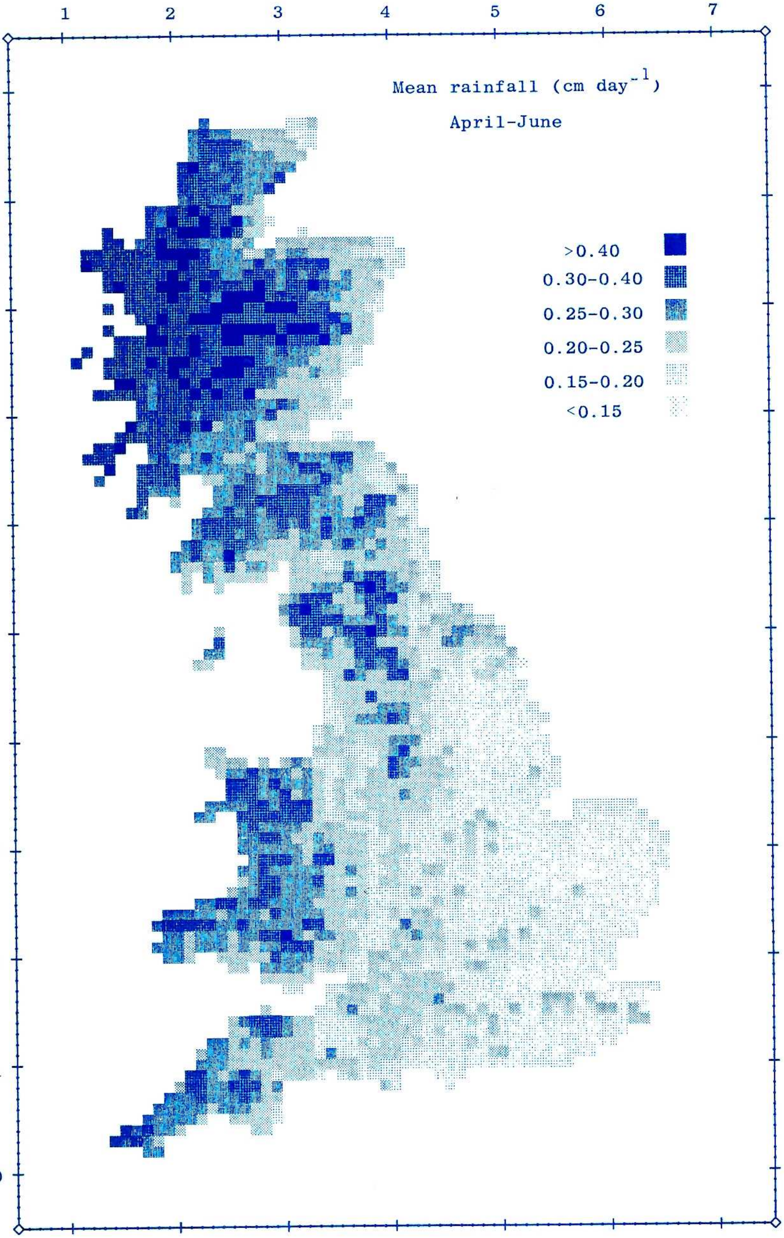
Map 3


Mean air temperature (°C)
at 0900 hours GMT in screen
1.3 m above ground
October-December
>8
6-8
4-6
2-4
0-2
<0
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

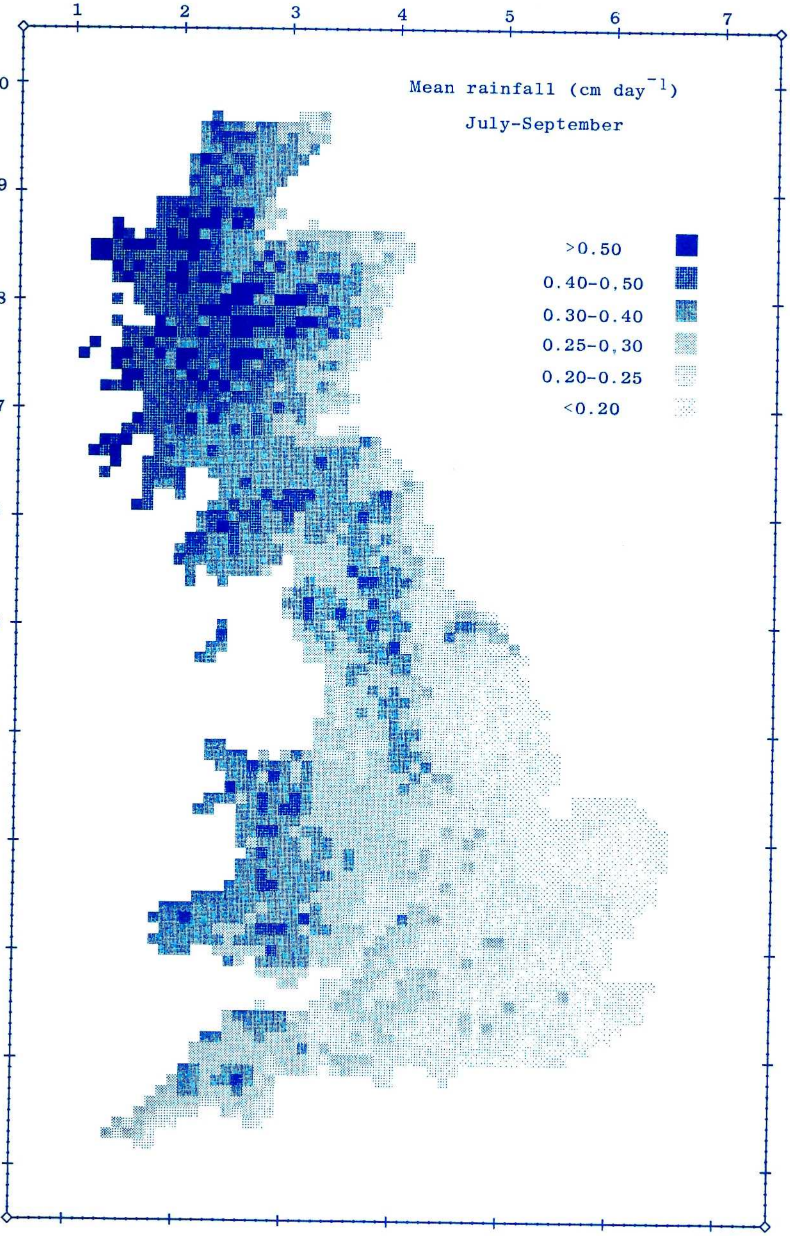
Map 4


Mean rainfall (cm day^{-1})
January-March
>0.40
0.30-0.40
0.25-0.30
0.20-0.25
0.15-0.20
<0.15
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

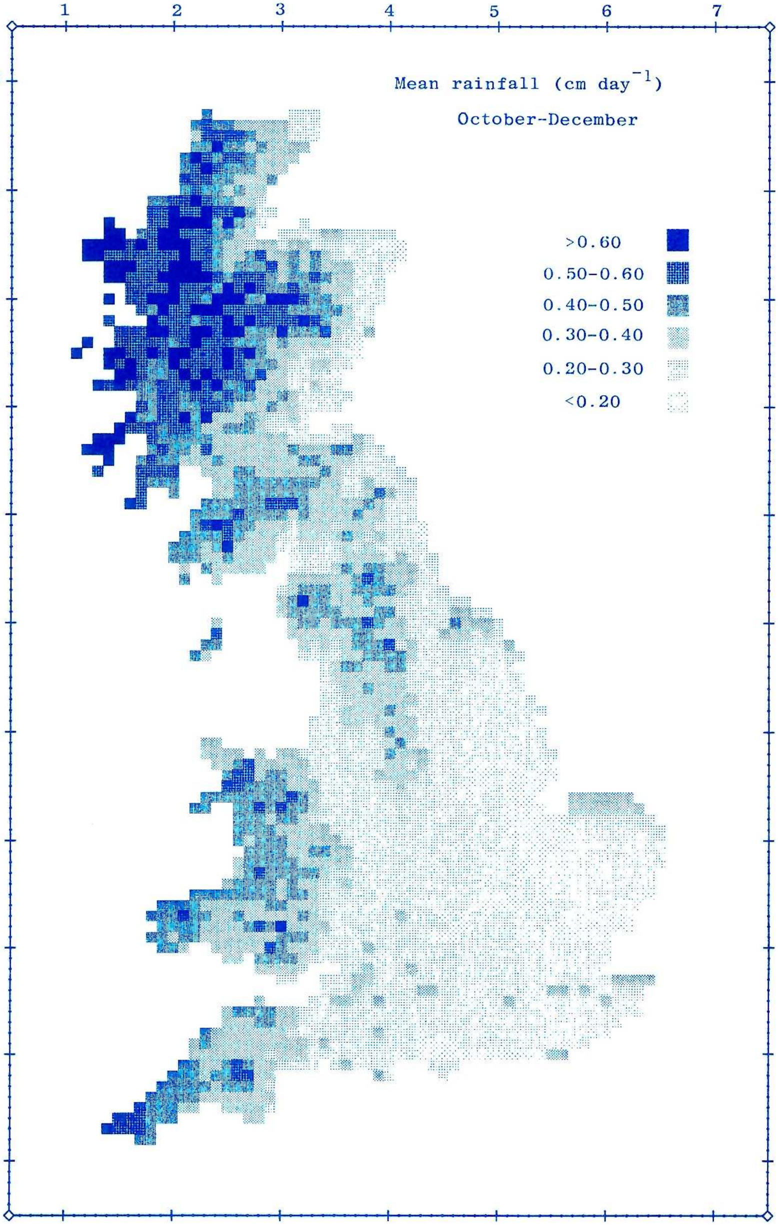
Map 5


Mean rainfall (cm day^{-1})
April-June
>0.40
0.30-0.40
0.25-0.30
0.20-0.25
0.15-0.20
<0.15
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

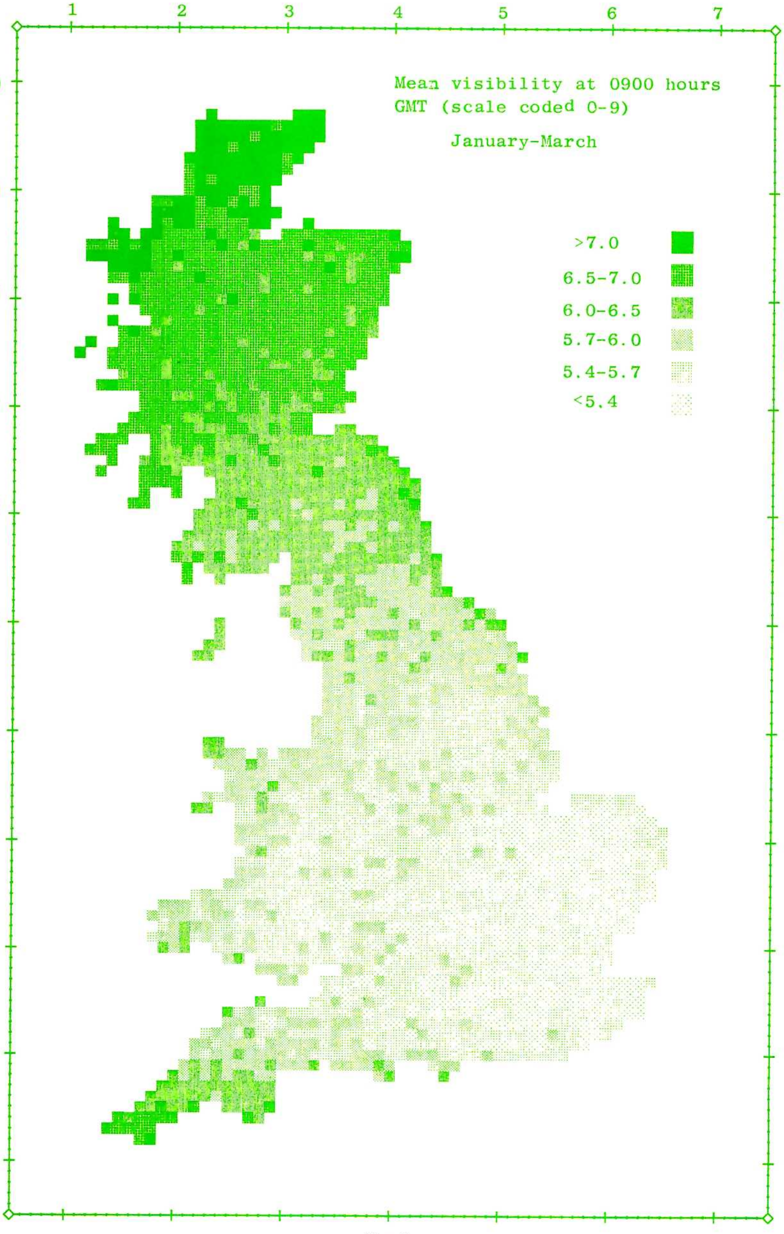
Map 6


Mean rainfall (cm day^{-1})
July-September
>0.50
0.40-0.50
0.30-0.40
0.25-0.30
0.20-0.25
<0.20
1
2
3
4
5
6
7
0
1
2
3
4
5
6
7
8
9
10

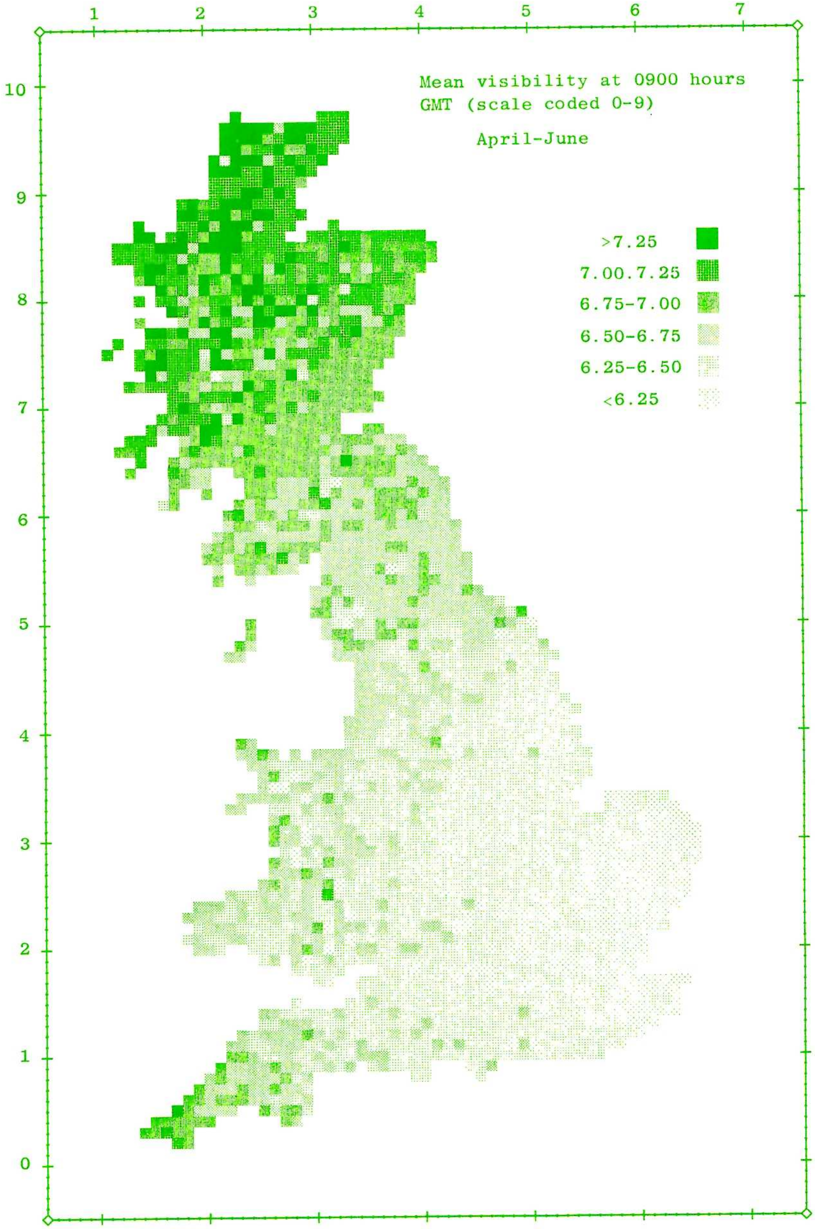
Map 7


Mean rainfall (cm day^{-1})
October-December
>0.60
0.50-0.60
0.40-0.50
0.30-0.40
0.20-0.30
<0.20
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

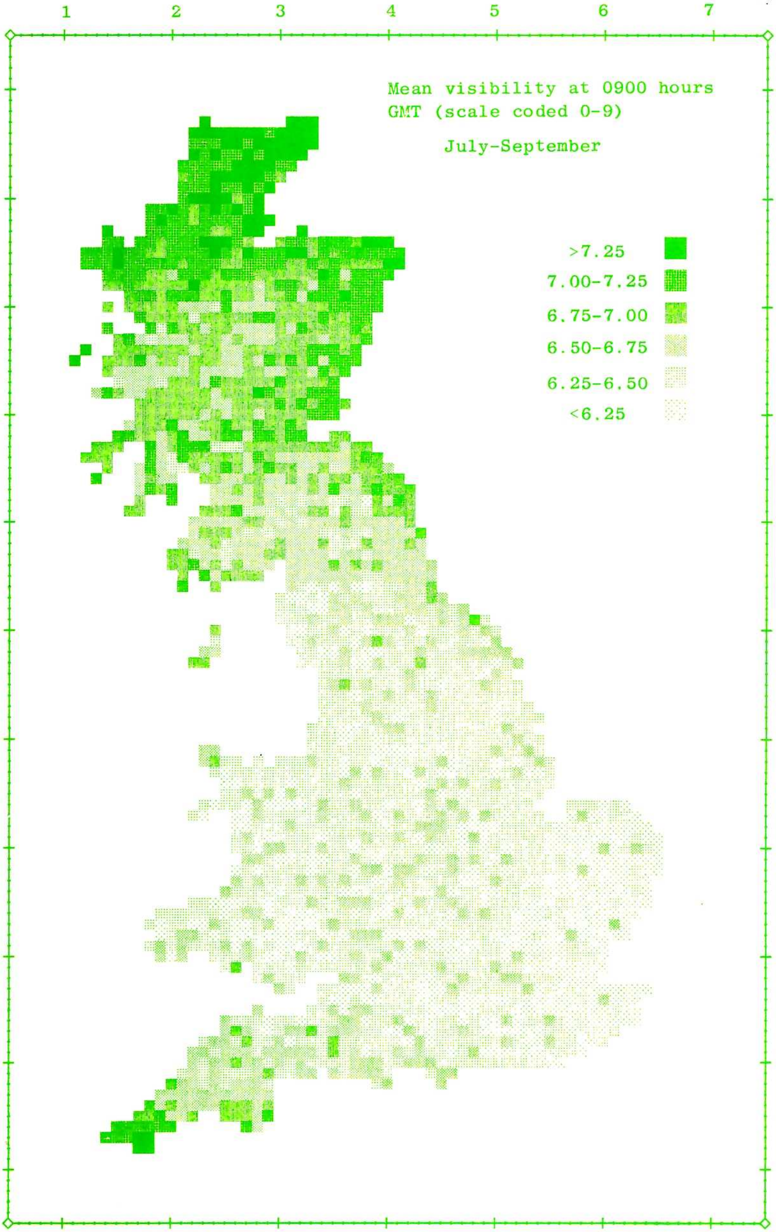
Map 8


Mean visibility at 0900 hours GMT (scale coded 0-9)
January-March
>7.0
6.5-7.0
6.0-6.5
5.7-6.0
5.4-5.7
<5.4
1
2
3
4
5
6
7
0
1
2
3
4
5
6
7
8
9
10

Map 9

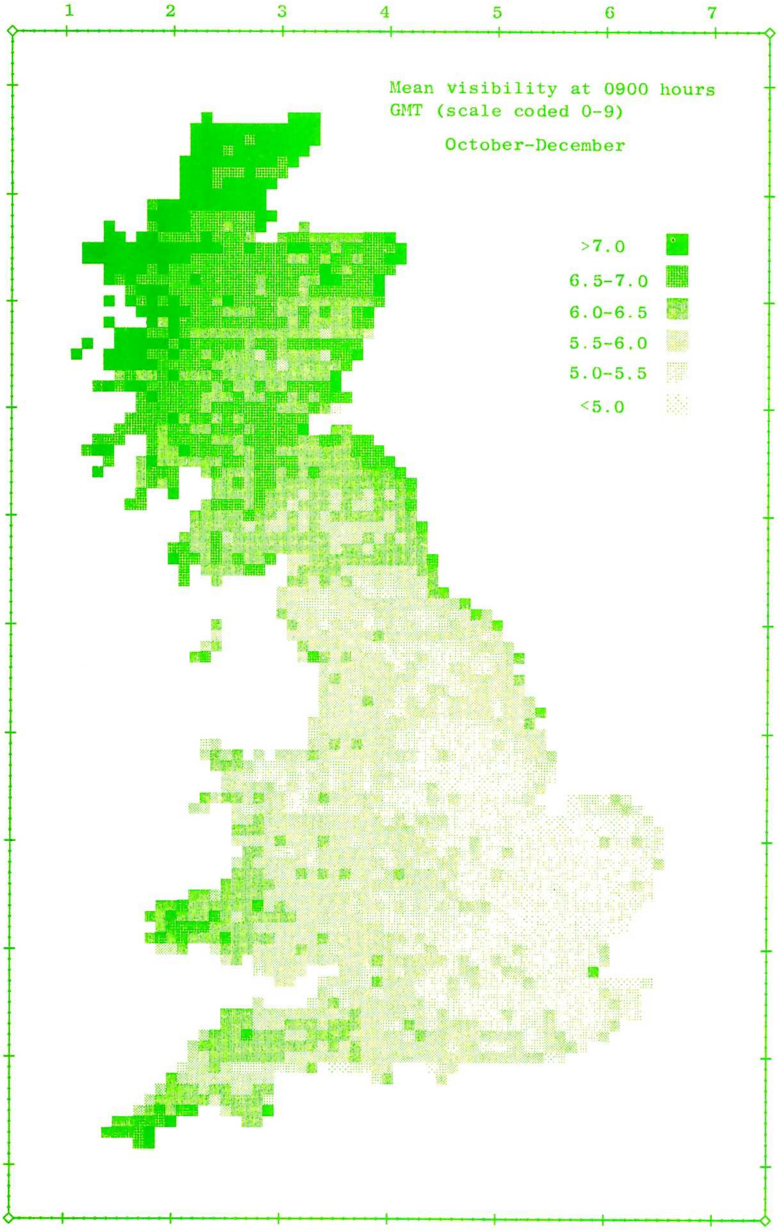

Mean visibility at 0900 hours GMT (scale coded 0-9)
April-June
>7.25
7.00.7.25
6.75-7.00
6.50-6.75
6.25-6.50
<6.25
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

Map 10



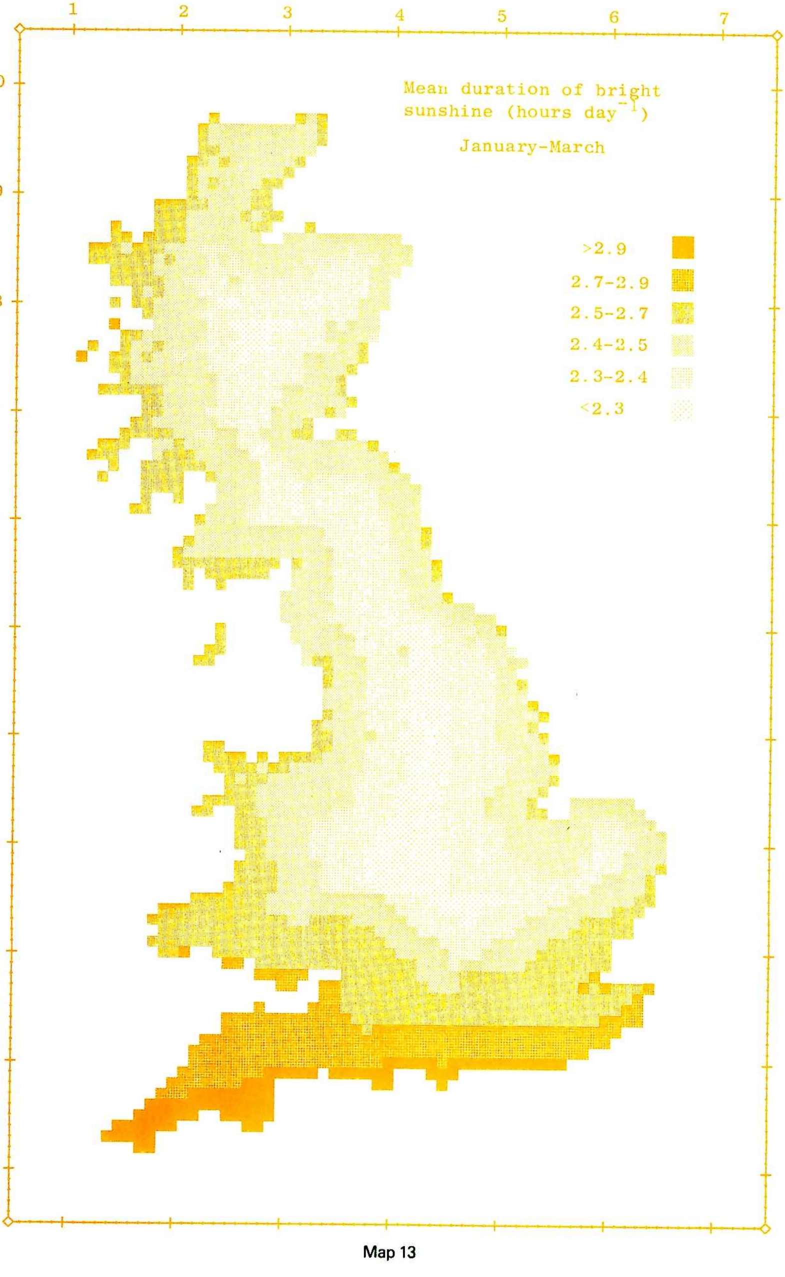
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0
Mean visibility at 0900 hours
GMT (scale coded 0-9)
July-September
>7.25
7.00-7.25
6.75-7.00
6.50-6.75
6.25-6.50
<6.25

Map 11



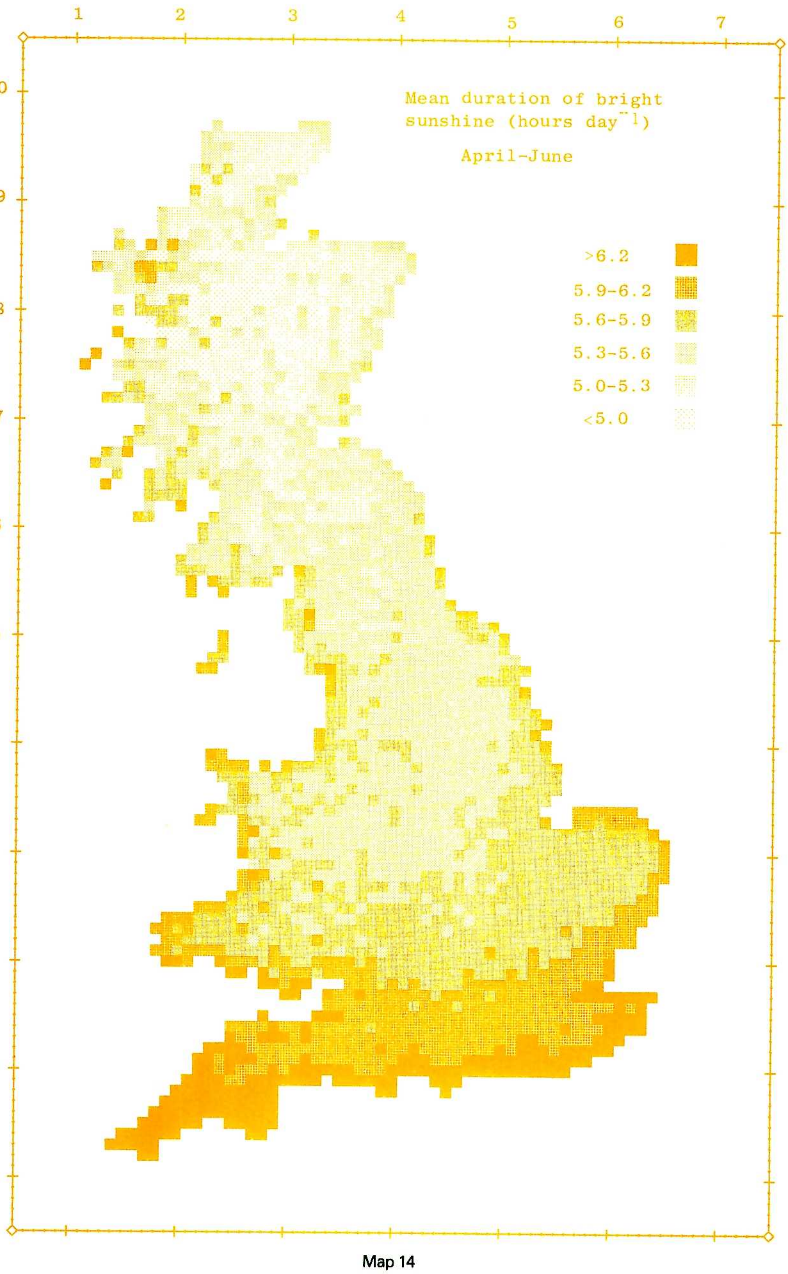
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0
Mean visibility at 0900 hours GMT (scale coded 0-9)
October-December
>7.0
6.5-7.0
6.0-6.5
5.5-6.0
5.0-5.5
<5.0

Map 12

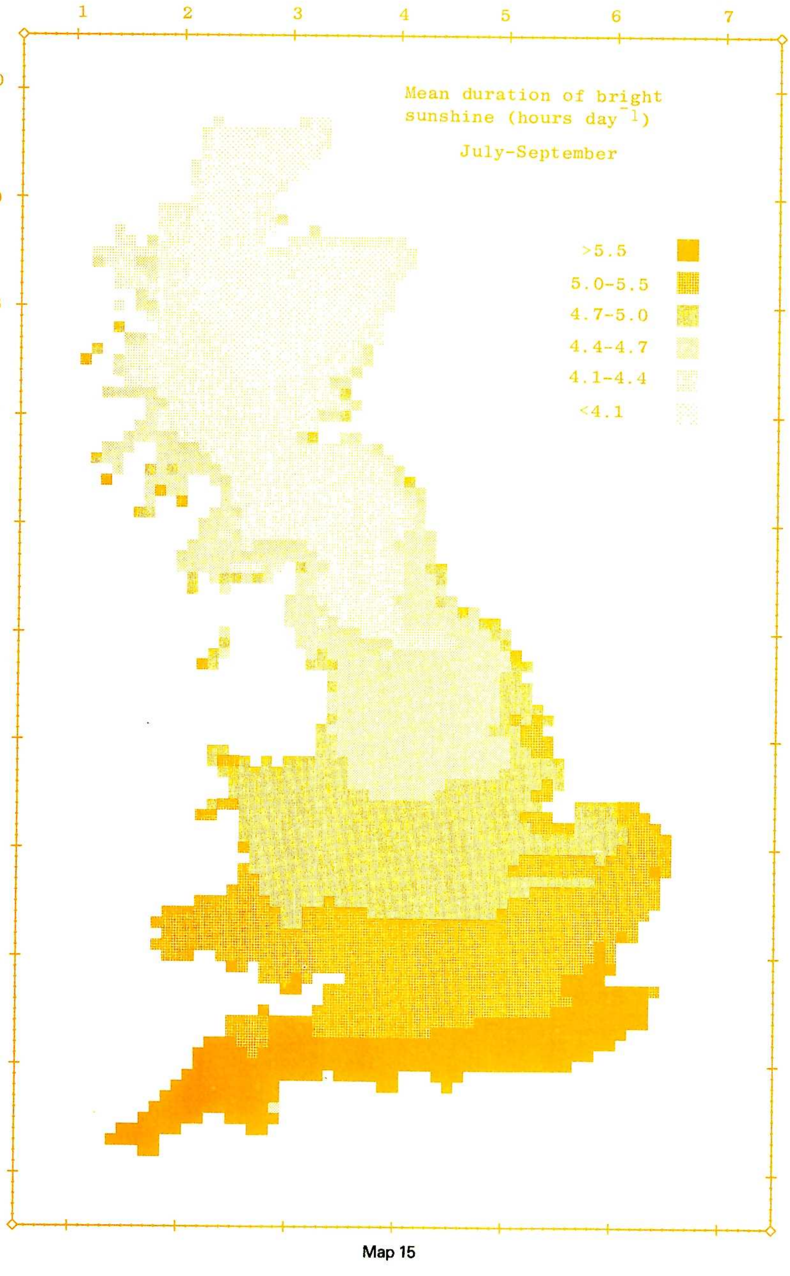


1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0
Mean duration of bright sunshine (hours day^{-1})
January-March
>2.9
2.7-2.9
2.5-2.7
2.4-2.5
2.3-2.4
<2.3

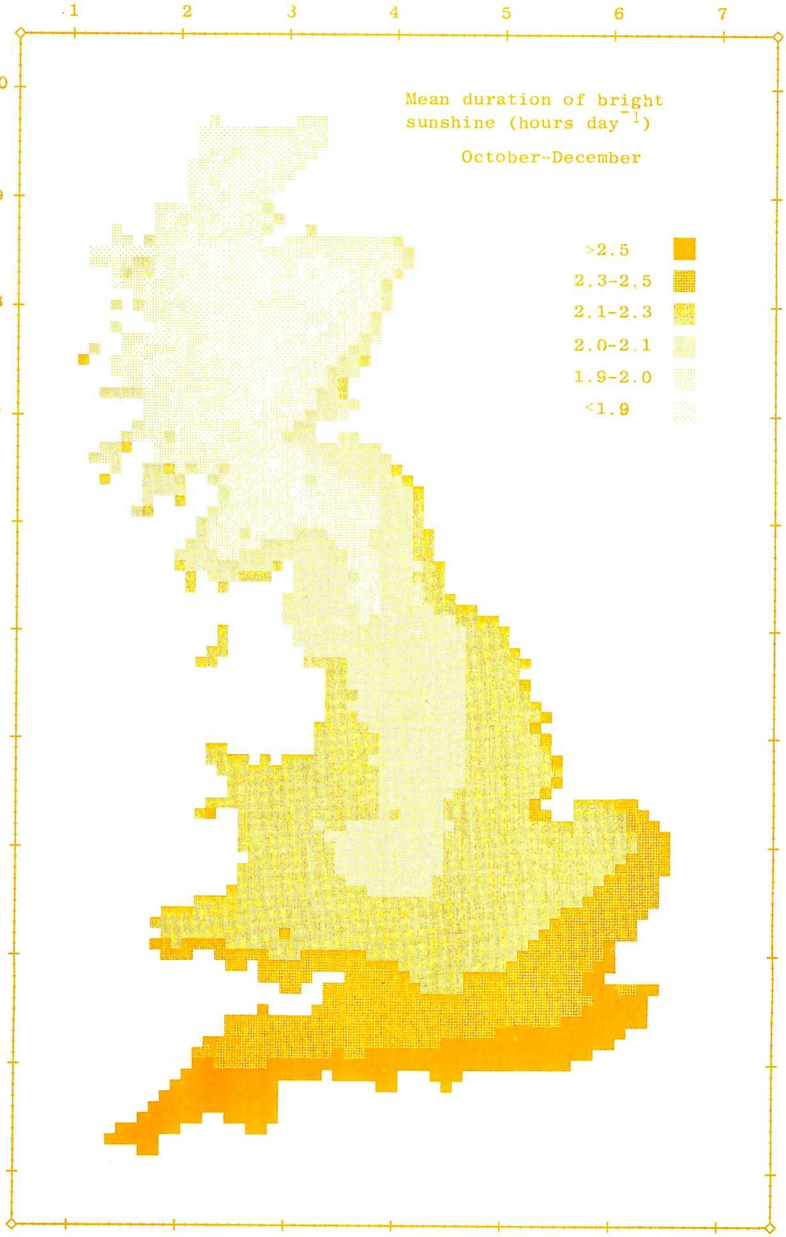
Map 13


Mean duration of bright sunshine (hours day^{-1})
April-June
>6.2
5.9-6.2
5.6-5.9
5.3-5.6
5.0-5.3
<5.0
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

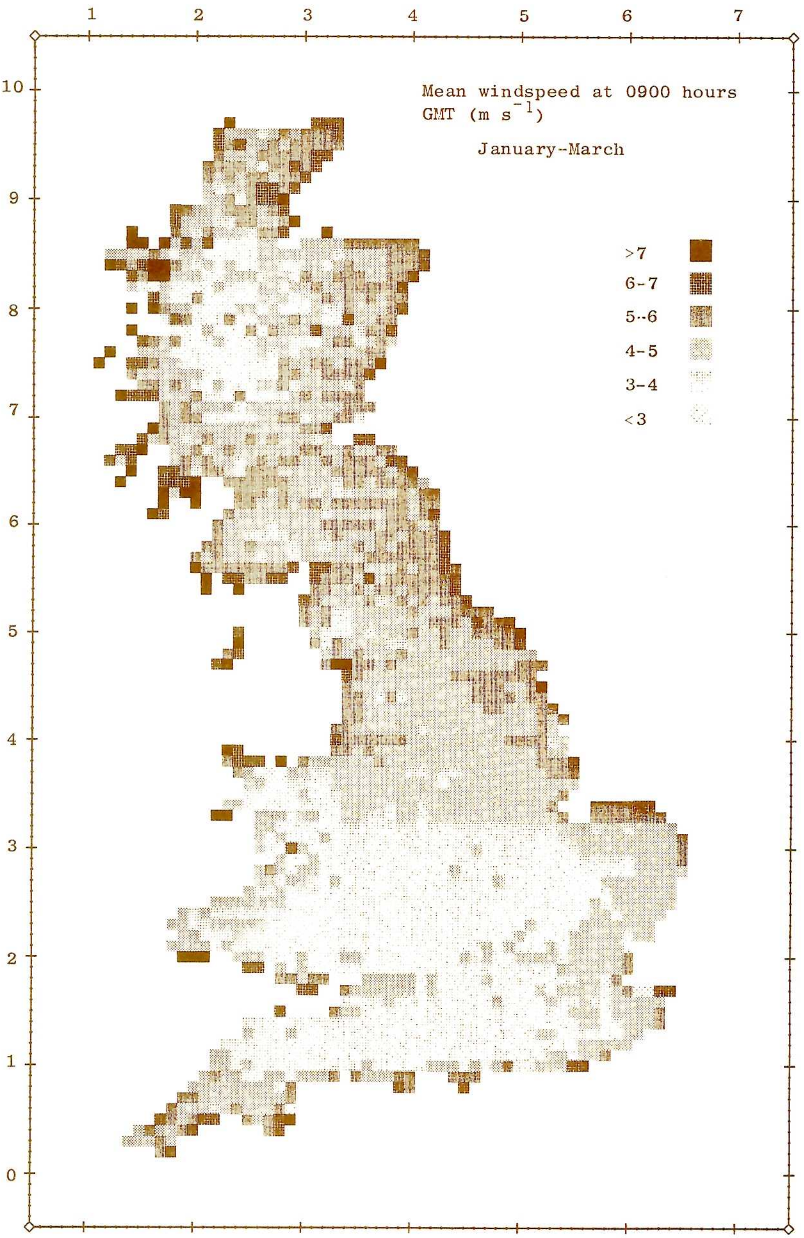
Map 14


Mean duration of bright sunshine (hours day⁻¹)
July-September
>5.5
5.0-5.5
4.7-5.0
4.4-4.7
4.1-4.4
<4.1
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

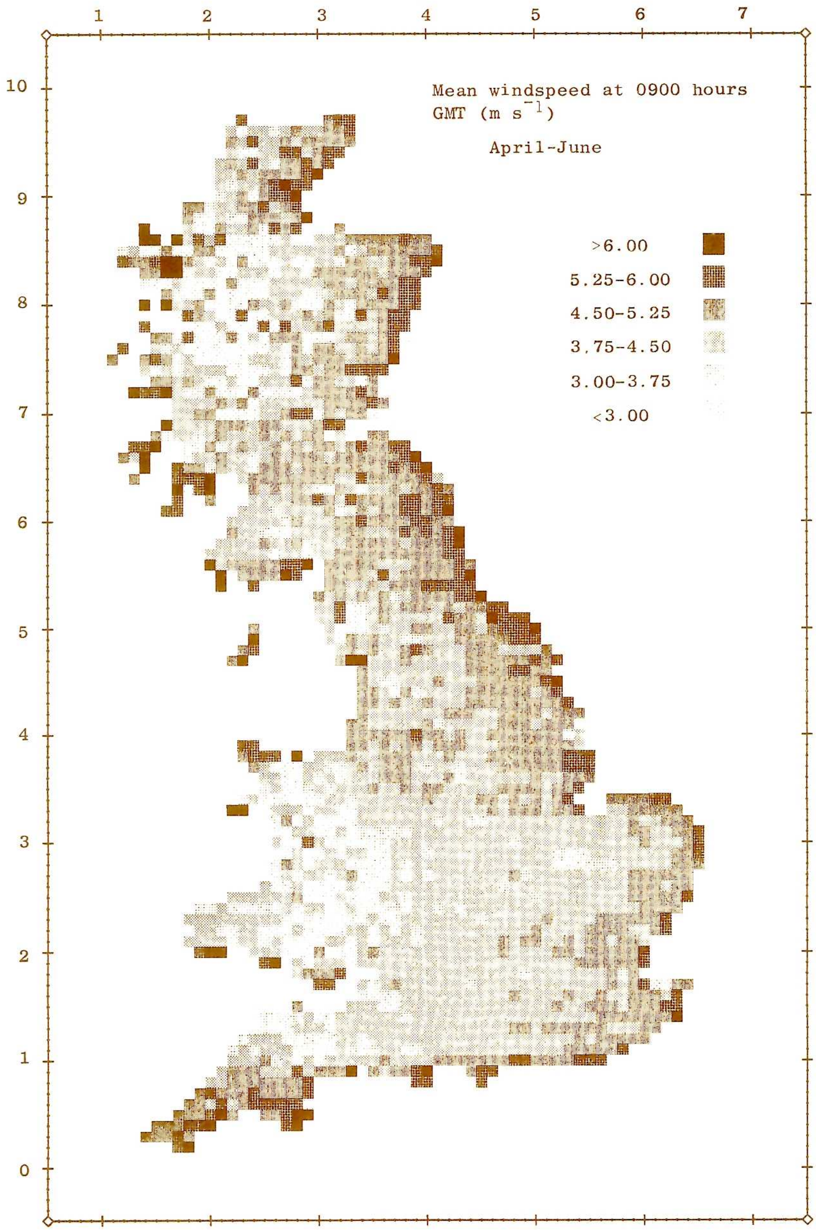
Map 15


Mean duration of bright sunshine (hours day^{-1})
October–December
>2.5
2.3–2.5
2.1–2.3
2.0–2.1
1.9–2.0
<1.9
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

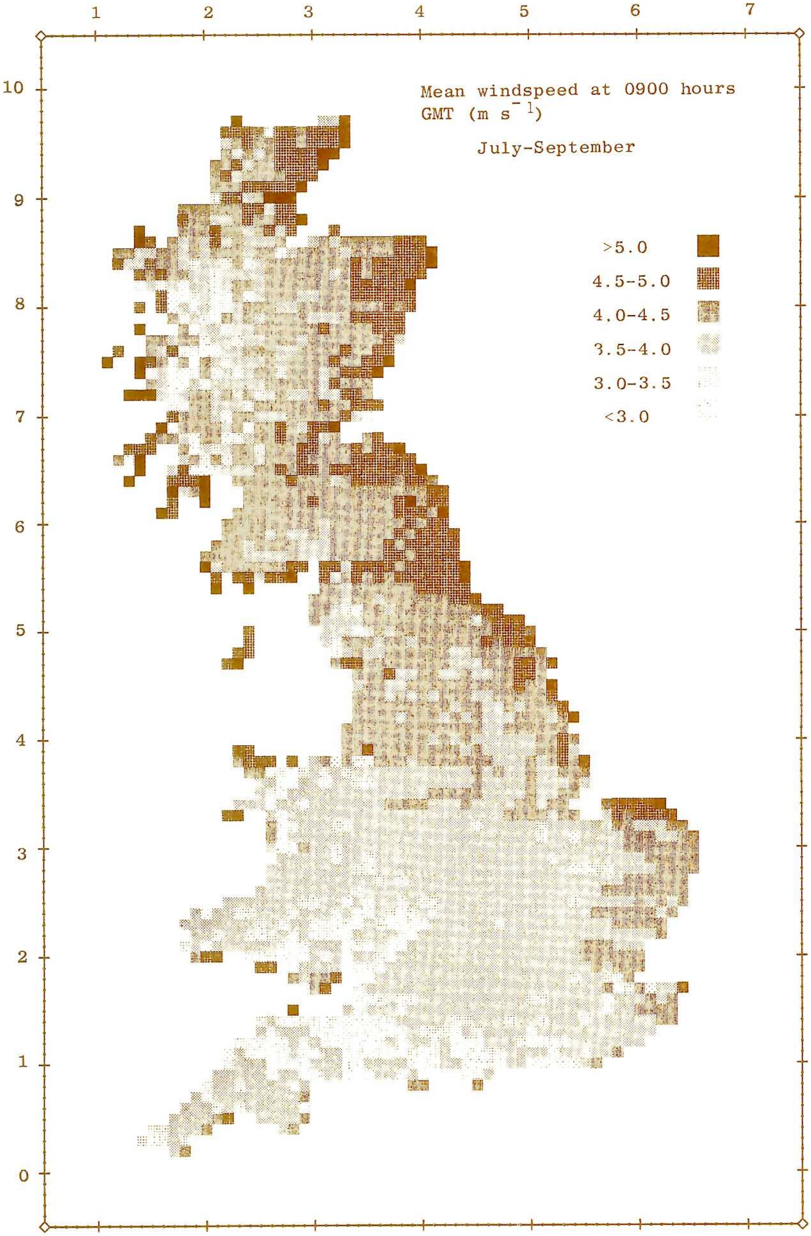
Map 16


Mean windspeed at 0900 hours GMT (m s^{-1})
January-March
>7
6-7
5-6
4-5
3-4
<3
1 2 3 4 5 6 7
0 1 2 3 4 5 6 7 8 9 10

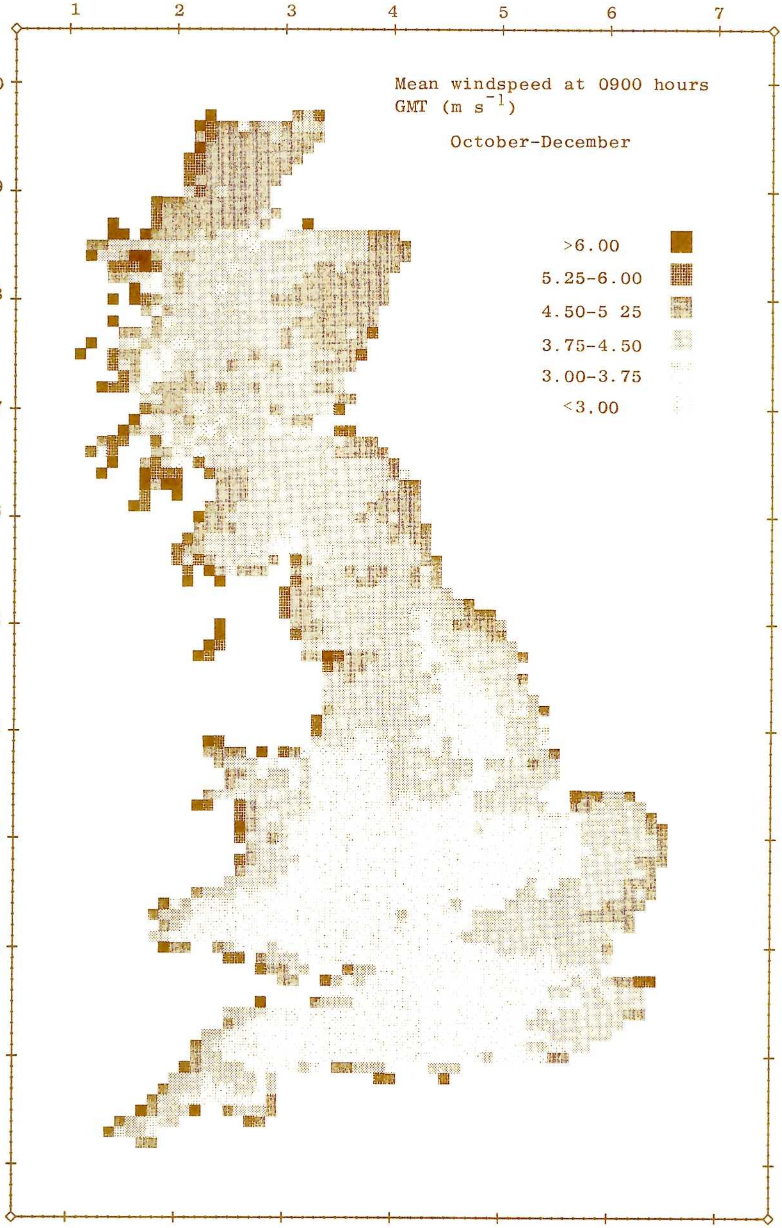
Map 17


Mean windspeed at 0900 hours GMT (m s⁻¹)
April-June
>6.00
5.25-6.00
4.50-5.25
3.75-4.50
3.00-3.75
<3.00
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

Map 18

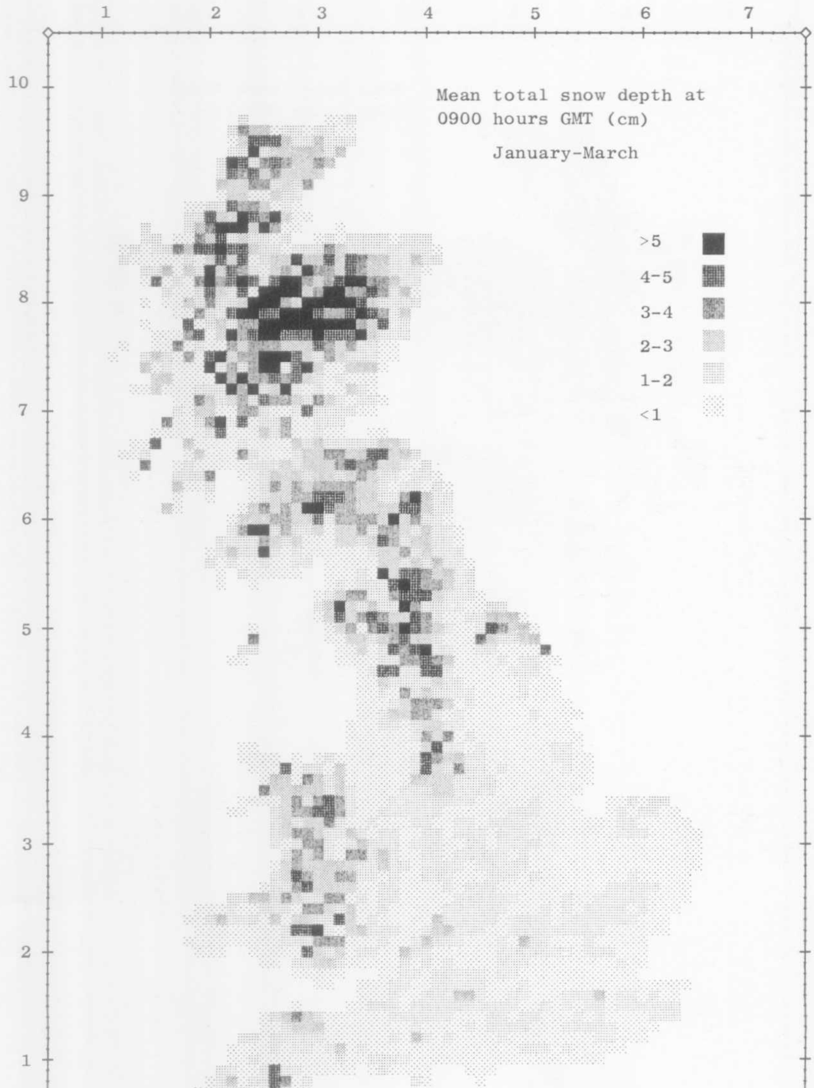

Mean windspeed at 0900 hours GMT (m s^{-1})
July-September
>5.0
4.5-5.0
4.0-4.5
3.5-4.0
3.0-3.5
<3.0
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

Map 19



1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0
Mean windspeed at 0900 hours GMT (m s^{-1})
October-December
>6.00
5.25-6.00
4.50-5 25
3.75-4.50
3.00-3.75
<3.00

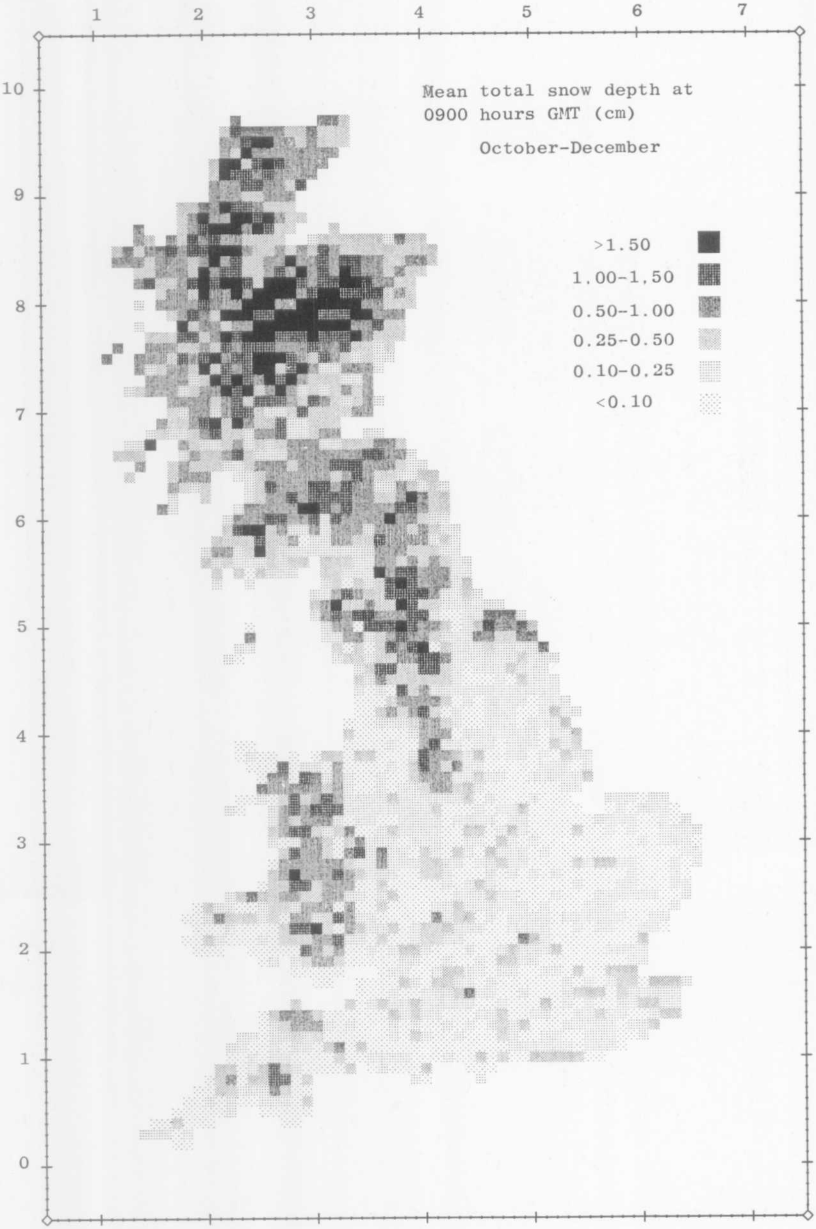
Map 20


Mean total snow depth at
0900 hours GMT (cm)
January-March
>5
4-5
3-4
2-3
1-2
<1
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

Map 21


Mean total snow depth at
0900 hours GMT (cm)
April-June
>0.50
0.25-0.50
0.10-0.25
<0.10
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

Map 22


Mean total snow depth at
0900 hours GMT (cm)
October-December
>1.50
1.00-1.50
0.50-1.00
0.25-0.50
0.10-0.25
<0.10
1
2
3
4
5
6
7
10
9
8
7
6
5
4
3
2
1
0

Map 23

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