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THE CLIMATE OF SOUTH-WEST AYRSHIRE AND NORTH KIRKCUDBRIGHTSHIRE

by

F. H. Dight, O.B.E., B.Sc.



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P R E F A C E

This memorandum is one of a series dealing in some detail with the differing climates of various regions of Scotland. The boundaries of the regions as delineated in the areal maps are artificial, but for convenience they coincide with areas for which the Macaulay Institute for Soil Research are currently engaged on preparing a series of Memoirs of the Soil Survey of Great Britain. This memorandum, and the others in the series are being used as a basis for the chapters on "Climate" in the corresponding memoirs of the Soil Survey.

It is hoped that the design of the memoranda is such as to be useful to a wide variety of interests. The approach is not purely one of presenting in consolidated form the data available in the Meteorological Office, but in some degree a more dynamic approach in relating cause and effect has been adopted.

The policy has been to build the climatic picture round the analysed data available from climatological stations which have been in operation over a long period of years and to supplement this information not only from the observations at stations now no longer operative but also by the inclusion of data from the many stations that have come into being during the past 10 years or so and for which a useful summary can now be made. Data for stations outside the nominal boundaries of the regions have been exploited where it is considered that these add representative detail to the picture or where it gives an important lead, especially in the absence within the boundaries of the region of a station with a similar exposure.

The periods on which the climatic tabulations have been constructed are given. The averages of the major elements, temperature, rainfall and sunshine (unless otherwise stated) are those for the standard 30 or 35 year periods currently in use but for the climatological summaries the observations up to and including those for 1964 have normally been utilised. When a station has suffered breaks in its records, either partially or completely and where these breaks are considerable, or otherwise appear important, a suitable annotation is made. It is relevant to remember that at meteorological offices at defence establishments and civil airports the weather watch is continuous for most or all of the 24 hours and the staff have opportunities for noting phenomena which the observer at a climatological station might miss.

In order to keep the tabulations within reasonable limits, full climatic data are normally given for long term stations, but for subsidiary stations some items, even where available, e.g. the number of rain days, are not given unless they show significant variations or there are other specific reasons for not presenting the figures as comparative data. Annual averages which are normally large, e.g. numbers of rain days, days of ground frost etc. are rounded off to the nearest whole number.

In accordance with official Meteorological Office policy, temperatures are usually given in degrees Celsius. Practically all the temperature data are recorded however, in degrees Fahrenheit and for this reason °F have been retained for individual extreme readings.

These maxima and minima were originally recorded in whole degrees °F obtained by throwing to the odd so that a recorded 32° F could be any value from 31.6° F to 32.4° F, and a recorded 33° F could be any value from 32.5° F to 33.5° F and so on. Recorded values of 32° F are important in relation to the frequency of frost. An air frost is currently defined as a day when the screen minimum fell below 32.0° F (0.0° C) but until 1st January 1963 a screen minimum which was recorded as 32° F (i.e. 32.4° F or less) was counted as a day of air frost. The average frequencies are therefore a little higher than they would be had the present more precise definition been operative.

/Statistics

Statistics of "ground frost" given in the climatological tables also need some qualification. Formerly a "ground frost" was recorded when the near surface temperature fell to 30.4° F and this criterion applies to practically all the observations on which the statistics are based. "Ground frosts" are not now recorded, the term being reserved for use in forecasting only. In their place grass minimum temperatures below 0.0°C are recorded. The average number of "ground frosts" given in the tabulations based on the former criterion are comparable among themselves and are not yet significantly affected by the new procedure.

The following key is applicable to the headings of the climatological summaries:-

R	=	a day with 0.1 in. or more of rain (09-09h GMT)
W	=	" " " 0.4 in. or more of rain
S	=	" " " snow or sleet falling
SL	=	" " " snow lying (snow covering one half or more of the ground representative of the station at 0900h GMT)
H	=	" " " hail
T	=	" " " thunder heard
F	=	" " " fog at 09h GMT
AF	=	" " " air frost
GF	=	" " " ground frost
G	=	" " " gale

} - for criteria see above

In the areal maps, stations are indicated as follows:-

■	=	Meteorological Office stations
▲	=	Co-operating climatological stations
●	=	Rainfall stations

For purposes of comparison with other localities and regions, the following publications may be consulted:-

M.O. 735	Averages of temperature for Great Britain and Northern Ireland 1931-60	H.M.S.O.
M.O. 743	Averages of bright sunshine for Great Britain and Northern Ireland 1931-60	"
M.O. 635	Averages of rainfall for Great Britain and Northern Ireland 1916-50	"
M.O. 421	Averages of Humidity for the British Isles	"
M.O. 488	Climatological Atlas of the British Isles	"

*Climatological Memoranda No.38, 1931-60
Averages of temperature and sunshine
for stations not included in M.O.735

*No.40, Frequencies of snow depth for given
ranges at selected stations in Scotland

* Available from Meteorological Office (Met O 3c) Bracknell
/*Hydrological

*Hydrological Memoranda

No. 1 (Revised) Part II - Monthly averages of rainfall for Scotland and Northern Ireland, 1916-50, for MWR stations.

- " 26 Rainfall, 1916-50, over the areas of Solway, Ayrshire and Clyde
- " 27 Rainfall, 1916-50, over the areas of Kintyre and S.W. Islands, Add, Awe, Etive, Lochy and Linnhe
- " 28 Rainfall, 1916-50, over the areas of Shield, Alsh, Maree, Inner and Outer Hebrides and Laxford
- " 29 Rainfall, 1916-50, over the areas of Naver, Thurso and Wick Water to Conan
- " 30 Rainfall, 1916-50, over the areas of Beaully and Ness, Banff, Moray and Nairn
- " 31 Rainfall, 1916-50, over the areas of Dee and Don, N & S. Esk and Tay
- " 32 Rainfall, 1916-50, over the areas of Forth, Lothians and Tweed

* Available from Meteorological Office (Met O 3c) Bracknell

THE CLIMATE OF SOUTH-WEST AYRSHIRE AND NORTHERN KIRKCUDBRIGHTSHIRE

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Introduction

The climatic survey here to be presented, relates to the region delineated in Figure 1 and comprising most of the southern spur of Ayrshire, and practically the whole of northern Kirkcudbrightshire.

It is obviously a rugged piece of country in which only relatively restricted areas lie below the 500 ft. contour. These low lying districts comprise sections of the coastal zone in the west from Girvan to Glen App, mainly associated with the valley of the R. Stinchar and its tributaries and to the south the moderately broad valley of the R. Cree complex especially in the vicinity of Loch Ochiltree. A small section of the Glenkens falls within the eastern boundary of the region. This small area carries all the arable farming, which is seldom practised above 400 ft.

Southward of the Stinchar valley are the Ballantrae Hills rising to over 1000 ft. and to 1435 ft. in Beneraird. North and east of the Stinchar and Cree valleys is a major spur of the Southern Uplands. Between a third and a half of the whole area under review exceeds 1000 ft. in altitude and extensive protrusions of mountainous country rise above 2500 ft. in the Carsphairn district, and in the Rhinns of Kells. Merrick 2764 ft., Corserine 2668 ft. and Cairnsmore 2612 ft. are the highest of a whole series of high peaks.

The upland country, between 500 and 1000 ft., is liberally endowed with lochs many of which are of appreciable size, notably Loch Doon in the northeast and Clatteringshaws in the southeast. It is an extensive area of peat production and accumulation, which peat forming area in fact extends to altitudes of about 1500 ft., some 300 ft. above the tree line. At still higher altitudes only very stunted vegetation survives in the near-alpine conditions of high winds, high rainfall, high humidity and frost shattering - without the more pleasant attributes of the real Alpine districts.

There are four main drainage systems. The Water of Deugh and the Black Water of Dee with their associated streams flowing southeast drain the eastern section. The central section is drained to the southward by the R. Cree and the tributaries Water of Minnoch and Water of Trool. Drainage in the west is via the R. Stinchar flowing southwestwards and the Duisk Burn flowing northwestwards through the lowland valley to join the Stinchar at Pinwherry. Finally the Gala Lane flowing northwards between the Rhinns of Kell and The Merrick discharges its waters into Loch Doon.

/General

General

The climatic picture of the Girvan-Carrick region is somewhat anomalous. This section of southwest Scotland is in close proximity to the relatively warm waters of the North Channel and the Irish Sea, which waters are subject to not infrequent surges of quite warm water from the South. The region is also apparently reasonably open to the mild southwesterly winds. It might be expected that the area would experience the mild if wet winters - and correspondingly cool summers - to be expected in such a situation (vide The Climate of Central Ayrshire)(1). Whilst this might be claimed for a restricted area near the coast, the overall picture is one of distinctly harsher winters and greater variability of climate with compensating spells of warmth in the middle part of the year.

It is true that the area of countryside below the 500 ft. contour is not extensive but in addition to the altitude factor some of the climatic variability must be ascribed to the effects of the hill country lying directly across the track of the southwesterly winds.

Winds

The general wind regime is dictated for the most part by the approach and passage of the North Atlantic depressions. Frequently the area falls within the main circulation of the major systems except when the storm tracks are well to northward toward the Icelandic area. An opposing synoptic pattern which tends to recur during the first half of the year and which can be persistent, is that with high pressure centred in northern latitudes.

The distribution of winds in the free air over the region resulting from these dominant synoptic patterns in conjunction with the more transient pressure distributions must conform closely to that recorded by the anemometer on Lowther Hill. The wind rose in Fig. 2 is based on four years of observations on the hill (July 1961-June 1964) and gives frequencies of both speed and direction for the year; seasonal frequencies of direction only are given below:-

Percentage frequencies of hourly winds

	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Spring (Mar.-May)	4.2	5.9	6.5	7.5	8.5	8.1	7.8	13.4	9.0	9.1	9.8	6.0
Summer (June-Aug.)	3.0	2.5	2.6	4.5	5.4	2.4	4.9	14.6	11.8	13.2	17.8	10.2
Autumn (Sept.-Nov.)	3.3	3.7	2.8	3.3	5.6	6.8	8.7	16.1	14.2	11.7	12.2	7.5
Winter (Dec.-Feb.)	6.1	6.8	6.9	9.5	6.7	5.1	5.3	10.7	9.7	9.1	12.5	8.8

The predominance of winds in the sector SW to NW over the year is very marked with a total frequency of 55% to which the summer and autumn seasons make the largest contributions. In spring all major directions are well represented, and winds with an easterly component have a fair incidence in the winter period also. Wind strengths in spring and autumn fall in the "moderate to fresh category of 11-21 kt. (13-24 m.p.h.) on about 45% of occasions, just about double the frequency of the strong winds of 22-33 kt. (25-38 m.p.h.). Gales blow at these seasons for some 5.5% to 6% of the time but the gale frequency in winter is nearly doubled at 9.5% with a corresponding stepping up of the duration of strong winds. This represents a mean value for the number of days of gale of nearly 100 annually. The windswept conditions prevailing over the high terrain of the area under review is further stressed by noting the highest gust speeds recorded at Lowther Hill over four years:- 106 kt. (120 m.p.h.) in February and 102 kt. (117 m.p.h.) in December of 1962 and 100 kt. (115 m.p.h.) in January 1963. Gusts of 80 kt. (92 m.p.h.) or more have occurred over the period in all months except April, July and August.

/At

At altitudes below about 2000 ft. the airflow is no longer largely unimpeded and two factors operate to produce considerable changes in velocity. In addition to the normal backing and reduction in speed with decreasing altitude, the prevalence of large scale eddies in rugged hill country of this type produces considerable changes in both speed and direction, sometimes over appreciable areas. In the absence of detailed records broad principles must suffice. The most windy area, considering now the normal surface regime, is the western section which has little effective shelter from the southwesterlies and westerlies, and is particularly vulnerable to northwesterly winds. Illustrative of the open exposure of the western near coastal strip is the high average value over the recent seven years of 17 days of gale per annum at Penwhirn at an altitude of around 500 ft., some seven days more than the average at Colmonell. The northwesterlies in particular have a suitably aligned "funnel" to the Cree valley and beyond. The same valley also provides an escape route for the southerly and southeasterly winds which have reasonably free access to the southern part of the area but which lose some of their momentum over the land to southward. Further, whilst the westerlies tend on the whole to be turbulent and gusty, winds from the southerly quarter are usually stable and "soft". Good shelter from the prevailing winds in the zone from Loch Doon to Loch Dee to Clatteringshaws is provided by the central massif, whilst the Glenkens enjoy the additional protection of the massive Rhinns of Kells. Easterlies on the other hand are less hindered in their approach and have reasonable access to these valleys and to the valley of the Black Water of Dee, but are not normally inclined to be strong. Some idea of the effectiveness of the shelter is indicated by the number of days of gale at the various stations (Table 5).

On the other hand topographical factors contribute to over exposure in other localities. Lines and Howell⁽²⁾ examining the degree of exposure suffered by various forestry sites in Scotland measured the amount of tatter suffered by specially designed flags. Although the rate of tatter is not exclusively due to wind, it is of interest that at a site in Carrick at an altitude of 1400 ft. they found the rate to be comparable with that measured in Shetland (at a lower height) where it was the highest at any of the Scottish localities examined.

Rainfall

The rainfall pattern is much that to be expected. The humid rainbearing southwesterly winds, after crossing Wigtownshire, enter the first stage of their forced ascent over the Southern Uplands. The same applies to the showery westerlies which normally supervene. A very narrow strip of the coastal zone and the lower reaches of the Stinchar valley have an average of rather less than 45 in. annually. This is increased by some five inches at the 500 ft. level and much of the southwestern section of the area receives between 50 and 60 in. Over the rising ground the average totals increase rapidly - 70 in. at 1000 ft., some 90 in. or more at 2000 ft., with probably 100 in. or more on the high peak lands.

North and east of the central mountain area the normal expectation of rainfall declines rapidly and an extensive area of rain shadow stretches well to eastward of the region, sharing with the Ken valley an annual average of 55 to 60 in. In the Carsphairn district the shadow effect is very marked and at the higher levels the average figure is 20 in. lower than that for similar altitudes in the Merrick and the Rhinns of Kell.

Autumn and early winter is the really wet season with around 45% of the yearly total occurring the four months October to January, with January slightly wetter than October in most places. In both these months totals of about 10 in. at 750 ft. are the rule rather than the exception and near coastal locations may be expected to have around 5 in. February with nearly a 50% reduction on the January totals usually initiates a decided

/change

change in the rainfall pattern. Successive reductions are associated with the increased liability to easterly winds in Spring, until May and June, normally somewhat wetter than the preceding months, begin the steady increase to the autumn/winter maximum.

An appreciable part of the summer increase in rainfall is attributable to the development of thunderstorms or areas of thundery rain in the mountainous districts, both local and in the Southern Uplands generally (see sections on thunder and temperature).

The very considerable variations in total rainfall from one locality to another are not at all closely related to the actual number of days on which rain occurs. The number of days with measurable falls (0.01 in. or more) does not vary widely and averages some 200 to 220 days per annum over a wide area and at all altitudes ranging up to at least 1000 ft. Days classed as "wet-days" (0.04 in. or more) are also reasonably uniform in number ranging between 165 to 180 days at widely separated stations but with a suggestion that the number increases above 1000 ft.

Lengthy dry spells of any frequency are hardly to be expected on the basis of the above statistics. Toward the coast, some nine months over the 20 years 1941-1960 have been credited with less than about one inch against nine months with over 7 in. Four of these dry months had less than 0.5 in. In all other districts however a monthly rainfall of less than one inch has been rare whereas falls of 10 to 12 in. or more are of relatively frequent occurrence. The extremes experienced may be illustrated by contrasting the exceptionally wet month of September 1950 with the very dry August of 1947. In 1950 the September totals ranged from 11.33 in. at Colmonell to no less than 20.35 in. at Loch Dee. In August 1947 practically the entire region had less than 0.25 in., including Loch Dee at 800 ft. Lagafater Lodge, also at 800 ft., recorded only 0.15 in. and less than 0.1 in. fell in the coastal zone. During another very dry period in March 1953 Glenlee was without rain from 27th February to 25th March (26 days).

Snow

Snow is infrequent and short-lived over at least most of the western half of the area, but with the inevitable increase to the northward and eastward with increasing altitude and increasing distance from the sea. Some localities, in the southwest however (vide Penwhirn, Table 5) would appear to have fared no better with regard to the incidence of snowfall in recent winters than localities at a similar altitude in the folds of the hill country much further east. Some guide to the total seasonal snowfall may be obtained by using some computations by A. B. Thomson (unpub.). Towards sea level about 2% of the average annual precipitation falls as snow; at around 1000 ft. the figure is 12% to 14%. During an average season some snow may be expected on 10 days at the lowest levels, increasing to around 40 days at 1250 ft. Snowfall tends to occur in appreciable amounts, usually with a polar depression moving SE from north of Ireland and is quickly followed by a thaw at the lower levels - a rather familiar situation on the western side of Britain.

In the infrequent exceptional winters like those of 1916-17, 1939-40, 1946-47 and in early 1963, when the "continental winter" of Central Scotland encroaches far to the southwest, snow may cover the ground for 20 to 30 days or so even toward the coast. The indications are that in the glens and valleys and on high ground about 1300 ft. the snow cover may then be continuous for up to two months. Depths of 12 in. or more of lying snow have been reported in the eastern part of the area during the past 10 years e.g. on 3 days at Glenlee in 1959-60. Comparison of the short term figures with the long period averages suggest that the recent decade has been a more snowy period than normal.

/Temperature

Temperature

The annual range of daily mean temperature at the lower altitudes is around 11.7°C ., but slightly lower than this near the coast and rather higher well inland and the hill country. The coastal zone, benefitting from the proximity of the warm sea and aided by the prevailing winds, has long spells of mild weather during the colder part of the year and in January, the coldest month, the monthly mean daily maximum temperature of 6.7°C . and the monthly mean daily minimum of about 0.8°C . are one degree or so higher than those for inland stations. The mild surface layer does not appear to extend far inland. The bleakness of exposed localities even quite near the coast in the extreme southwest of the region at a height of about 500 ft. is pinpointed reasonably well by the temperature observations from Penwhirn. Here the monthly mean daily maximum in most months is 1.5°C . lower than that in more sheltered localities at not so greatly lower altitudes (cf. Penwhirn and Barr Table 4B). Some part of this large difference is due to the expanse of water of the artificial loch immediately to westward of the reporting station. From mid-May onwards the advantage of warmer days is with the central and eastern inland districts where the monthly mean daily maximum in the warmest months of June and July of around 19°C . is some 1.5°C higher than that near the coast. This is true for altitudes of at least 500 ft. and in the glens and folds of the rugged country the difference is probably even greater.

At altitude the normal rule for reduction of daily mean temperatures by 0.6°C . per 100 metres appears to hold fairly closely. Thus at about 1300 ft. the annual range is from 1°C . to nearly 13°C . permitting estimated figures for 2200 ft. of from -0.5°C . in January to 10.5°C . in July. On the whole the summer afternoons are somewhat cooler and the winter nights less cold than the direct application of the reduction factor would suggest. At the really high altitudes the mean value of the summer afternoon maximum in July is around 13.5°C . whilst the mean night minimum temperature reaches freezing point about mid-November and remains well below this vital datum through December to the middle of April. Freezing temperatures at these heights, virtually in the free atmosphere, are not greatly dependent on light winds and clear skies, and freezing winds with cloud cover on the mountains are sometimes responsible for heavy rime and ice deposits.

Extreme temperatures in this type of country are frequently the result of the topography. Quite high temperature, between 26° and 30°C ., can occur in the glens and valleys sheltered from any wind on fine sunny days, usually in late spring and early summer but they may also occur over the lower ground right out to the coast with light easterly breezes. In winter - and more frequently than the very high values of summer - unduly low temperatures occur at night in the folds and glens where cold air can accumulate after drainage down the hill slopes. In these circumstances it is often several degrees warmer higher up the slopes than at the bottom of the glen. Thus at Glenlee in a near typical glen situation the absolute range of temperature is from -1°F . to 86°F . (Table 4A).

Some apparently unseasonably high temperatures will be noted, especially in autumn when 21°C . has been exceeded, and these appear to be evidence of some föhn effects to the lee of high ground under suitable conditions, in which case föhn must contribute to some of the other occasional high readings.

The incidence of night air frosts in the valley areas of the rivers Stinchar and Cree averages some 75 to 80 nights per annum over the recent nine year period including the very severe period of early 1963, as compared with about 65 near the coast. July is the only month to be practically immune from air frost. Relatively flat locations at altitudes ranging from 600 ft. to 1200 ft. do not appear to be very sensitive to the altitude change, the number of frost nights approaching 100 in the course of an average winter season. An equally high incidence is found in the narrower glens and defiles even at considerably lower altitudes (e.g. Glenlee - Table 5). At 2000 ft. and above there is a fairly high

/proportion

proportion of "wind frosts", the general freezing level in the free atmosphere being below the level of the highest ground. A probable average figure is about 150 night frosts per season, allowing in an average season only three or four frost free nights in each of the three months December to February.

In spite of the frequent night frosts and the low temperatures achieved at times, the glens often warm up quickly during the forenoon. Thus at Glenlee the average number of "freezing days" per annum is 23 - a "freezing day" being defined as one in which the arithmetic mean of the maximum and minimum temperature for the day does not exceed 0.3°C . At 1200 ft. there are 40 such days (13 in both January and February).

The Growing Season

The length of the "growing season", based on the usual threshold value of 5.6°C . for the daily mean temperature, is, for the lower altitudes toward the west coast much like that for the Ayrshire Plain⁽¹⁾. Thus for the Colmonell district the season begins about mid-March and is sustained until the end of November, with an average length of period of 262 days. At similarly low levels in the eastern valleys the period is some three weeks shorter. Superimposed on the west to east change, there is the steady reduction with increasing altitude giving an average figure of 230 days at about 500 ft. declining to 200 days at 1200 ft. or so, through the period from mid-April to near the end of October. On the wind swept heights, little growth is likely until towards the end of May and the season is probably limited to about 150 days.

Evapotranspiration

Estimates of evapotranspiration for localities in such rugged and often elevated country must be subject to some reservation, the actual values doubtless being subject to variation as with the other meteorological parameters due to topography etc. It is only in exceptional years however that the rainfall is likely to be insufficient to meet the demands.

The Stinchar valley district is probably very similar to that of much of Ayrshire with a figure of Potential Transpiration (P.T.) among the highest in Scotland. The somewhat lower figures than those for Ayrshire which are applicable to much of Kirkcudbrightshire, seem a fair estimate for the valleys drained by the R. Cree and its tributaries, but for most of the remainder of the region further considerable reduction is to be expected with a figure much like that of north Dumfriesshire, except perhaps in the valley of the Ken where some extra sunshine may more than compensate for lack of wind.

The monthly totals for the months of the growing season and the cumulative totals in inches for summer and winter for the three county districts, taken from "Irrigation"⁽³⁾, are given in Table 2 as some indication of the variability of the evapotranspiration over the region.

Table 2. Average Values of Evapotranspiration(P.T.)

<u>County</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Summer</u>	<u>Winter</u>	<u>Year</u>
Ayr	1.85	3.25	3.60	3.30	2.60	1.50	16.10	2.85	18.95
Kirkcudbright	1.90	2.95	3.35	3.20	2.80	1.55	15.75	3.00	18.75
North Dumfries	1.60	2.85	3.05	2.80	2.40	1.20	13.90	2.60	16.50

/Hail

Hail and Thunder

Hail, by the very nature of its formation, is a phenomenon of varied incidence, particularly over the very broken country of the region under review. Dundough and Glenlee appear to be examples of localities with a low incidence of hail but there is evidence that the phenomenon occurs more frequently in other localities in the hills in meteorological conditions which are apparently similar over a wide area. The general and seasonal patterns are however very clearly delineated. Westwards towards the coast the frequency of hail storms increases in late autumn to reach a maximum in December and January when storms are especially frequent on and near the coast. Until recent years no clear distinction was drawn in the observing procedure between the hard hailstone and the soft hail or granular snow of winter. This is probably of less import of the western coast of Scotland than in eastern and central areas. The storms are developed at this season in polar air masses over the relatively warm sea and for the most part decay on moving inland. Thus this winter maximum falls away progressively to the eastward and is replaced in eastern districts by a spring maximum in about April with the necessary convection generated by insolation over the land. Thereafter over the whole region there is a rapid and sharp decline to quite low values during the summer. Hail is extremely unusual in July and uncommon in August throughout the region and toward the coast the immunity persists from June through to September, inclusive.

This demise of the hail season is coincident with the upsurge of the thunderstorm season to a maximum frequency in July and August over the whole region. A significant frequency of thunder is however noticeable in the hill/mountain area in May, June, and early September. Short lived cold frontal storms occasionally occur in the other months, more especially on and near the coast and in the mountains around the mid-winter period.

Fog

Radiation fogs in the lower lying areas are infrequent in the colder half of the year, partly because there is little, if any, industrial pollution to assist their development or encourage their persistence. Fog patches probably develop locally on some summer evenings with clearing skies following thundery rains of the afternoon and evening but these disperse rapidly with the early dawn. Patches of sea fog are occasionally drifted in over the coast by a favourable breeze in summer but penetration inland is mostly thwarted by the rising land behind the coast, but they do invade the Stinchar valley.

Climatically the important "fog" is the all too frequent envelopment of the higher ground in a sheet of thick low cloud, with or without precipitation, usually following the onset of a mild humid southwesterly air mass, or the rather extensive patches formed on the windward side by the forced ascent of moderately humid air by a particular section of higher ground. The incidence is again very variable, often extensive on the windward side but more broken and less persistent on the leeward side. Thus the highest ground is enveloped in cloud at 9h. G.M.T. on considerably more than 200 days annually (perhaps on as many as 250 days). Except perhaps in deep winter these cloud areas often break up and the base lifts to clear the tops as the day advances. Considered in conjunction with the number of air frosts and freezing days experienced at the higher levels, heavy deposits of rime or glaze are inevitable at times in the cold part of the year when the rather specialised conditions for such phenomena occur.

General considerations of the rainfall and the prevailing winds indicate the prevalence of a fairly high average relative humidity for much of the year even at moderate to low levels with prolonged spells of high humidity at the higher levels. The easterly winds of later spring and early summer are normally fairly dry winds and are responsible for lowering

/the

the average relative humidity in the early part of the afternoon - normally the time of day of the lowest humidity - to around 66% in June at altitude of around 650-700 ft. and probably some 2-3% lower in the valleys and glens. In fine weather the figure on an individual day occasionally falls to 55% and very infrequently can be around 35%. The average value rises sharply for July to about 72%. Local fohn effects lower the humidity very effectively over restricted areas, usually for periods of a few hours, but exceptionally for a day or more.

An interesting phenomenon is the occurrence of very low relative humidities at the really high levels. These low values occur in certain anticyclonic conditions, which develop rather infrequently, when the normal temperature inversion is brought very low by subsidence and any cloud sheet (or patches) comes well below the height of the highest ground.

Sunshine

The average yearly total of sunshine over the coastal strip approximates closely to that over the Ayrshire coast and plain (vide Memorandum on The Climate of Central Ayrshire)⁽¹⁾ with at least 1300 hours in a reasonable summer. Over the six years 1958-64 Penwhirn had a mean value of 1350 hours in spite of the very mediocre summers of 1961-64. May and June are normally the sunniest months with July and August much less reliable, but in view of the very short daylight hours the relatively large totals in the late winter period deserve favourable mention. Sunshine totals in the major valleys are probably similar. To the east and northeast however there would seem to be a steady decline, although there are probably sheltered lee areas which enjoy more sunshine than the generalised figures indicate.

Over the really high ground above 2000 ft. the Lowther Hill figures, suggesting an average of about 900 hours annually, are probably a good indication of conditions over the peak areas. Over the past 10 years the variation from the best sunshine year (1959) to the least favourable (1961) at Lowther Hill almost certainly exceeds 400 hours. (There are no records for January to March 1955). The same large percentage variation is evident in months of the same name, except perhaps in May which is the most consistently sunny month of the year. Although July and August are often notoriously poor at these high levels, over the 10 years July 1955 was the sunniest month with no less than 267 hours but in 1961 the same month brought only 65 hours, August 1963 with only 57 hours holds the record as the poorest summer month so far recorded.

Table 3. Short Period Mean Sunshine Values - Hours

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
Lowther Hill (9*-10 yrs.)	27*	49*	61*	110	154	145	118	98	88	53	34	20	957
Penwhirn (6 yrs.)	59	73	95	147	201	189	155	147	118	75	50	42	1351

References

- (1) The Climate of Central Ayrshire (in preparation) - to be issued shortly as a Climatological Memorandum.
- (2) R. Lines and R. S. Howell; "The use of flags to estimate the relative exposure of trial plantations". Forestry Commission; Forest Record 51.
- (3) London, Ministry of Agriculture, Fisheries and Food. Irrigation. Bull. Minist. Agric. Fish. Fd., London, No. 138, 1962, p.13.

Table 4A. Averages of Temperature, 1931-60, and extremes

	COLMONELL (170 ft.)							GLENLEE (181 ft.)						
	Average			Extreme Ø				Average			Extreme Ø			
	Max.	Min.	Mean	Max.	Year	Min.	Year	Max.	Min.	Mean	Max.	Year	Min.	Year
	°C	°C	°C	°F		°F		°C	°C	°C	°F		°F	
Jan.	6.7	0.9	3.8	59	1958	7	1940	5.9	-0.6	2.6	56	1957) '60)	-1	1940
Feb.	7.0	0.9	4.0	59	'53	11	'47) '55)	6.7	0.0	3.3	57	'45	9	'47) '63)
Mar.	9.2	2.0	5.6	67	'29	12	'47	9.2	1.1	5.1	68	'46	4	'47
Apr.	11.4	3.6	7.5	72	'21	16	'27	12.1	2.8	7.4	70	'42	21	'53) '56) '58)
May	14.8	5.5	10.2	80	'27) '50)	26	'15) '27) '38) '41)	15.7	4.9	10.3	79	'52	25	'38) '48)
June	17.0	8.6	12.8	85	'36	31	'57	18.3	8.2	13.3	85	'50	29	'62
July	18.0	10.6	14.3	86	'48	36	'19) '54) '58)	19.3	10.2	14.8	86	'48	33	'58
Aug.	18.0	10.4	14.2	82	'30	34	'44	18.9	9.6	14.3	84	'47	32	'56) '64)
Sep.	16.1	8.7	12.4	77	'34	26	'42) '43)	16.5	7.9	12.2	78	'59	24	'43
Oct.	13.0	6.3	9.7	71	'21) '26) '59)	21	'26	12.8	5.0	8.9	72	'59	20	'56
Nov.	9.7	3.7	6.7	63	'27	15	'19	9.2	2.3	5.8	61	'38	13	'52
Dec.	7.8	2.2	5.0	57	'18) '54)	14	'25	7.1	0.9	4.0	56	'47) '53) '54) '55)	5	'61
Year	12.4	5.3	8.9	86	'48	7	'40	12.6	4.4	8.5	86	'48	-1	'40

Extreme values for periods:-

COLMONELL 1914-60
 GLENLEE 1937-64
 LEADHILLS 1914-27, 1953-64

Ø See Preface for explanations of use of °F

/Table 4A (contd.)

Table 4A (contd.) Averages of Temperature, 1931-60, and extremes

	LEADHILLS (1270 ft.)							DUNDEUGH * (390 ft.)		
	Average			Extreme Ø				Average		
	Max.	Min.	Mean	Max.	Year	Min.	Year	Max.	Min.	Mean
	°C	°C	°C	°F		°F		°C	°C	°C
Jan.	4.1	-1.7	1.2	54	1955	5	1918	5.3	-0.9	2.1
Feb.	3.4	-1.4	1.0	53	'60	7	'56	6.1	-0.8	2.7
Mar.	6.6	-0.1	3.3	62	'57	9	'54) '62)	8.5	0.4	4.5
Apr.	9.4	1.5	5.4	68	'15	10	'17	11.1	1.8	6.4
May	13.3	3.4	8.3	79	'19	20	'57	14.8	3.9	9.3
June	16.2	6.6	11.4	81	'25	27	'62	17.5	7.3	12.4
July	16.9	8.8	12.8	79	'14) '21) '23) '55)	29	'54	18.1	9.5	13.8
Aug.	16.6	8.6	12.6	80	'14) '55)	30	'56) '44)	17.8	8.9	13.3
Sep.	14.0	7.0	10.5	75	'59) '61)	23	'54	15.7	7.6	11.6
Oct.	10.3	4.7	7.5	69	'59	19	'26) '55)	12.2	4.6	8.4
Nov.	6.7	1.8	4.3	59	'21	10	'19	8.9	2.0	5.5
Dec.	4.6	0.3	2.4	60	'18	5	'61	6.8	0.4	3.6
Year	10.2	3.3	6.7	81	'25	5	'18 '61	11.9	3.7	7.8

Extreme values for periods:-

COLMONELL 1914-60
 GLENLEE 1937-64
 LEADHILLS 1914-27, 1953-64

* Provisional computed average

Ø See Preface for explanations of use of °F

/Table 4B

Table 4B. Short Period Mean Temperatures For Period Mar. 1958-Feb. 1965 (except where otherwise indicated) and extremes.

	BARR (400 ft.)							BARGRENNAN (360 ft.)						
	Average			Extreme Ø				Average			Extreme Ø			
	Max.	Min.	Mean	Max.	Year	Min.	Year	Max.	Min.	Mean	Max.	Year	Min.	Year
	°C	°C	°C	°F		°F		°C	°C	°C	°F		°F	
Jan.	5.9+	-0.9+	2.5	51	1960	5	1962	5.6	-0.9	2.3	50	1960) '64)	11	1962
Feb.	7.2+	0.0+	3.6	57	'62	13	'60	6.5	-0.2	3.2	55	'60	12	'63
Mar.	8.5	0.9	4.7	61	'60	13	'62	8.4	1.2	4.8	60	'60	15	'58) '62)
Apl.	11.7	2.9	7.3	66	'62	19	'58	11.9	3.0	7.4	64	'58) '62)	23	'58
May	15.1	4.9	10.0	77	'64	27	'58) '60)	15.2	5.0	10.1	76	'59	27	'58
June	17.3	7.9	12.6	79	'60	29	'62	17.3	7.8	12.5	79	'60	30	'62
July	17.8	9.2	13.5	79	'63	33	'58	17.6	8.8	13.2	78	'58	35	'58) '63)
Aug.	17.3	9.1	13.2	77	'59	30	'64	17.4	8.9	13.2	80	'59	31	'64
Sep.	16.4	7.5	11.9	78	'59	29	'60	16.2	7.6	11.9	77	'59	30	'64
Oct.	12.8	6.1	9.4	73	'59	23	'60	12.9	6.1	9.5	72	'59	26	'60) '62)
Nov.	8.9	2.3	5.6	57	'59) '63)	19	'63	9.2	2.6	5.9	57	'59	22	'62
Dec.	5.9+	-0.6+	2.7	52	'64	5	'61	6.1	-0.3	2.9	52	'59) '61) '62)	9	'61
Year	12.1	4.1	8.1	79	'60 '63	5	'60 '61 '62	12.0	4.1	8.1	80	'59	9	'61

+ No observations cold winter 1962-3

Ø See Preface for explanation of use of °F

/Table 4B (Contd.)

Table 4B. (contd.) Short Period Mean Temperatures For Period Mar. 1958-Feb. 1965
(except where otherwise indicated) and extremes.

	DUNDEUGH (390 ft.)							LOWTHER HILL (2373 ft.) Aug. 1959- July 1965						
	Average			Extreme Ø				Average			Extreme Ø			
	Max.	Min.	Mean	Max.	Year	Min.	Year	Max.	Min.	Mean	Max.	Year	Min.	Year
	°C	°C	°C	°F		°F		°C	°C	°C	°F		°F	
Jan.	5.0	-2.3	1.4	52	1960) '64)	9	1963	0.9	-3.0	-1.1	48	1961	13	1962
Feb.	6.1	-1.7	2.2	57	'60	7	'63	0.8	-3.4	-1.3	45	'62	13	'60
Mar.	7.8	0.1	3.9	58	'60	11	'62) '63)	2.4	-2.4	0.0	56	'65	11	'65
Apl.	11.3	2.2	6.8	63	'62	18	'58	6.1	0.0	3.1	57	'62	19	'61
May	14.7	4.1	9.4	75	'59	24	'60	9.3	2.4	5.9	66	'64	26	'62
June	17.1	7.3	12.2	79	'60	26	'62	12.0	5.3	8.7	72	'63	23	'60
July	17.6	8.6	13.1	78	'58	31	'58	11.7	6.0	8.9	66	'63	36	'62
Aug.	17.3	8.7	13.0	82	'59	29	'64	12.2	6.6	9.4	74	'59	34	'64
Sep.	16.0	6.9	11.4	78	'59	27	'64	10.8	5.5	8.1	66	'61	31	'60
Oct.	12.7	5.2	8.9	71	'59	23	'60	7.7	2.9	5.3	63	'59	19	'64
Nov.	8.8	1.6	5.2	57	'58	17	'62) '63)	4.1	-0.1	2.0	51	'64	15	'62
Dec.	5.7	-1.4	2.1	54	'62	3	'61	1.3	-2.9	-0.8	46	'61	15	'63
Year	11.7	3.3	7.5	82	'59	3	'61	6.6	1.4	4.0	74	'59	11	'65

PENWHIRN (546 ft.)							
	Average			Extreme Ø			
	Max.	Min.	Mean	Max.	Year	Min.	Year
	°C	°C	°C	°F		°F	
Jan.	5.1	-0.9	2.1	50	1958)	15	1963
					'60)		
Feb.	5.6	-0.9	2.4	54	'61	13	'62
Mar.	7.1	1.1	4.1	57	'60	17	'62
Apl.	10.3	3.1	6.7	62	'58	24	'58
May	13.4	5.3	9.3	73	'59	29	'58)
							'60)
June	15.7	7.5	11.6	76	'60	31	'62
July	16.2	9.4	12.8	76	'58	37	'58
Aug.	15.9	9.7	12.8	74	'59	36	'64
Sep.	14.9	8.3	11.6	74	'59	34	'64
Oct.	11.9	7.1	9.5	68	'59	27	'62
Nov.	8.3	3.3	5.8	54	'58)	23	'63
					'59)		
					'61)		
					'62)		
					'63)		
Dec.	5.7	0.3	3.0	51	'61)	11	'61
					'64)		
Year	10.9	4.5	7.7	76	'58	11	'61
					'60		

Ø See Preface for explanation
of use of °F

Table 5. Climatological Summaries - Average Number of Days of Occurrence of Specified Phenomena - Period as Indicated.
(for explanation of heading, see Preface)

	COLMONELL 1939-58 (20 years)									
	(18-20 yrs)									
	R	W	S	SL	H	T	F	AF*	GF	G
Jan.	20.4	16.7	2.8	1.7	1.5	0.1	0.9	13.5	12.7	2.0
Feb.	16.1	12.9	2.5	1.4	1.5	0.1	0.9	14.0	11.8	1.1
Mar.	15.2	11.4	2.0	1.2	1.3	0.1	0.9	7.6	12.7	0.8
Apl.	15.3	11.6	0.8	0.2	1.3	0	0.5	5.0	8.7	0.8
May	13.7	10.6	0.1	0	0.3	0.3	0.5	2.2	4.1	0.2
June	14.5	11.3	0	0	0	0.3	0.5	0.4	0.5	0+
July	17.3	13.6	0	0	0+	1.0	0.5	0	0	0+
Aug.	17.9	13.8	0	0	0	0.9	0.5	0	0.1	0.2
Sep.	18.0	14.5	0	0	0.1	0.5	0.4	0.2	1.1	0.6
Oct.	19.1	15.7	0.2	0	0.7	0.4	0.5	1.0	4.0	1.1
Nov.	19.0	15.5	0.6	0.3	1.5	0.3	1.0	4.0	9.0	1.4
Dec.	21.4	18.2	1.9	1.0	2.1	0.4	1.3	9.2	10.9	1.7
Year	208+	166+	10.9	5.8	10.3	4.4	8.4	57 +	76+	9.9

	GLENLEE 1937-64 (28 years)									
	R	W	S	SL	H	T	F	AF*	GF	G
Jan.	19.3	16.3	7.1	4.6	0.7	0.1	1.2	20.1	19.9	0.4
Feb.	16.7	13.4	6.2	3.0	0.4	0.1	0.6	16.4	17.1	0.5
Mar.	15.2	12.3	4.0	1.0	0.3	0+	1.0	12.7	15.9	0+
Apl.	16.0	12.7	1.1	0	0.4	0	0.3	9.0	11.4	0.1
May	14.3	11.8	0.3	0+	0.4	0.8	0+	3.3	6.4	0+
June	15.6	12.1	0	0	0.2	0.5	0	0.9	1.2	0.1
July	17.0	13.2	0	0	0	0.9	0	0	0+	0+
Aug.	18.6	14.4	0	0	0+	0.8	0+	0.2	0.2	0.3
Sep.	18.4	15.3	0	0	0.1	0.4	0.2	1.1	1.6	0.1
Oct.	19.3	15.3	0.1	0	0.4	0.3	1.0	2.8	5.8	0.3
Nov.	19.5	16.4	1.3	0.1	0.5	0.2	0.7	9.9	12.0	0.2
Dec.	20.7	17.5	4.1	2.4	0.6	0.1	1.2	17.3	16.4	0.5
Year	211+	171+	24.2	11.1	4.0	4.2	6.2	94+	108+	2.5

* Period 1956-64

+ Rounded off to whole number

0+ denotes less than 0.5

/Table 5 (contd.)

Table 5. (contd.)

- 17 -

	DUNDEUGH 1958-64 (7 years)							
	W	S	SL	H	T	F	AF	G
Jan.	13.2	3.9	3.9	0	0	1.3	21.0	0.6
Feb.	12.9	4.3	7.6	0	0	0.9	17.3	1.0
Mar.	11.3	2.1	2.0	0	0	0.6	15.3	0.3
Apl.	14.4	1.0	0.4	0.6	0.3	0	8.1	0.3
May	12.9	0	0	0	1.4	0.1	4.4	0
June	11.7	0	0	0	0.9	0.3	0.4	0.3
July	12.3	0	0	0	1.3	0.1	0.1	0
Aug.	14.9	0	0	0	1.7	0	0.7	0.1
Sep.	14.3	0	0	0	0.9	0.7	0.6	0.1
Oct.	15.6	1.0	0	0	0.4	0.9	2.7	0.1
Nov.	17.0	1.7	0.4	0.1	0.3	1.1	10.6	0.4
Dec.	15.6	5.1	4.0	0.3	0.1	1.3	18.1	0.9
Year	166+	19.1	18.3	1.0	7.3	7.3	99+	4.1

	BARR 1958-64 (6-7 years)							
	W	S	SL	H	T	F	AF	G
Jan.	15.8	4.9	1.8 /	4.0	1.2	0.2	16.6 /	2.0
Feb.	15.5	4.3	3.0 /	3.3	0.3	0.5	11.6 /	1.0
Mar.	11.9	2.4	0.9	1.6	0.3	0	11.0	0.1
Apl.	15.0	1.1	0.4	1.3	0	0	5.7	0.1
May	12.6	0	0	0.4	1.7	0.1	2.4	0.1
June	12.3	0	0	0	0.7	0.3	0.3	0.3
July	14.4	0	0	0	0.9	0.6	0	0.4
Aug.	16.6	0	0	0.3	1.1	0.1	0.1	0.1
Sep.	16.0	0	0	0.4	0.7	0.1	0.4	0.9
Oct.	15.5	0	0	2.4	1.3	0.1	2.0	1.1
Nov.	17.7	1.4	0.4	2.3	0.7	0	8.3	0.7
Dec.	16.7	4.5 /	2.5 /	4.7	0.7	0.4	15.2 /	2.1
Year	180+	18.6	9.0	20.7	9.4	2.4	74+	8.9

* Period 1956-64

+ Rounded off to whole number

0+ denotes less than 0.5

~~/~~ No observations cold winter 1962-63

/Table 5 (contd.)

Table 5. (contd.)

	BARGRENNAN 1958-64 (7 years)							
	W	S	SL	H	T	F	AF	GF
Jan.	14.1	5.1	2.9	2.1	0.4	1.3	19.0	23.9
Feb.	14.1	4.9	3.1	0.7	0.1	1.0	15.1	18.7
Mar.	12.0	3.3	0.6	0.6	0	0.6	10.4	15.3
Apl.	14.9	1.7	0.3	0.6	0.1	0.6	6.4	12.1
May	12.1	0	0	0.4	1.3	0.3	2.4	9.6
June	12.7	0	0	0	0.6	0.3	0.1	2.3
July	14.7	0	0	0	0.7	0.3	0	1.3
Aug.	15.7	0	0	0.1	1.6	0.1	0.1	1.8
Sep.	16.0	0	0	0	0.7	0.6	0.1	2.9
Oct.	16.3	0	0	0.3	1.1	0.1	1.3	8.1
Nov.	17.6	1.3	0.3	0.4	0.4	0.7	8.6	14.4
Dec.	16.3	5.0	1.1	1.6	0.3	0.6	17.7	23.1
Year	177+	21.3	8.3	6.8	7.3	6.5	81+	133+

	PENNAHIRN 1958-64 (7 years)								
	W	S	SL	H	T	F	AF	GF	G
Jan.	15.4	4.9	6.7	1.3	0.6	3.6	18.0	23.1	3.1
Feb.	12.9	4.0	6.6	2.0	0.1	3.0	13.9	17.1	2.3
Mar.	12.9	3.7	3.4	1.4	0.3	3.3	11.7	17.1	1.9
Apl.	15.1	1.0	0.6	0.7	0	2.1	5.1	10.1	0.9
May	11.3	0	0	0.1	2.1	1.3	1.1	5.0	0.7
June	11.9	0	0	0	0.9	1.0	0.1	1.1	0.4
July	13.1	0	0	0.1	1.3	1.1	0	0	0.7
Aug.	16.0	0	0	0	1.3	1.0	0	0.4	0.4
Sep.	15.9	0	0	0	0.9	1.3	0	0.7	0.7
Oct.	16.0	0.1	0	0.7	1.0	2.0	0.3	4.3	2.0
Nov.	17.7	1.4	0.1	1.7	0.3	2.4	5.3	12.0	1.6
Dec.	16.0	3.4	2.1	1.0	1.1	2.7	12.9	20.3	2.6
Year	174+	18.5	19.5	9.0	9.9	24.8	68+	111+	17.3

* Period 1956-64

+ Rounded off to whole number

0+ denotes less than 0.5

/Table 5 (contd.)

Table 5. (contd.)

	LEADHILLS 1914-27 and 1953-64 (25-26 years)									
	(11-12 yrs.)						F	AF*	GF	G
	R	W	S	SL	H	T				
Jan.	21.7	18.3	9.4	11.0	0.8	0.2	1.6	20.1	21.7	1.8
Feb.	18.8	15.4	8.7	11.3	0.6	0	0.8	17.7	19.8	1.4
Mar.	16.8	13.7	6.8	7.3	0.9	0.2	0.7	13.2	18.5	0.6
Apl.	17.5	14.6	4.3	2.5	1.2	0.3	0.5	9.9	15.3	0.2
May	17.2	14.2	1.9	0.6	0.9	1.2	0.9	4.3	9.4	0+
June	16.3	13.1	0+	0	0.7	1.2	0.1	1.4	3.0	0.4
July	18.9	15.7	0	0	0	1.4	0.3	0	0.6	0+
Aug.	20.8	17.6	0	0	0.3	1.5	0.1	0.3	0.6	0.1
Sep.	19.5	16.9	0.2	0+	0.6	0.7	0.6	1.0	2.3	0.5
Oct.	19.3	16.2	1.2	0.6	0.7	0.4	0.4	2.7	6.5	0.7
Nov.	19.4	16.1	3.2	4.9	0.5	0+	1.3	9.9	12.1	0.9
Dec.	21.4	18.6	8.0	8.7	0.5	0+	1.4	16.6	17.1	1.6
Year	228+	190+	43.7	46.9	7.7	7.6	8.7	97+	127+	8.2

	LOWTHER HILL (4-5 yrs.)					
	(5-6 yrs)					G
	S	H	T	F	AF	
Jan.	12.8	0.4	0.2	19.4	27.8	11.4
Feb.	8.2	0.8	0	17.4	24.5	9.4
Mar.	9.6	1.0	0	20.2	24.5	9.0
Apl.	6.4	1.4	0.2	17.2	12.8	7.0
May	3.4	1.2	1.0	13.2	5.8	8.2
June	0.5	0	0.8	13.0	1.2	4.8
July	0	0	1.5	16.0	0	5.5
Aug.	0.2	0	0.5	20.0	0	6.0
Sep.	0	0.5	0.8	18.7	0.6	7.8
Oct.	3.3	0.8	1.0	22.8	4.8	9.5
Nov.	6.7	0.2	0.2	21.0	16.4	9.3
Dec.	13.0	0.5	0	19.3	28.2	10.8
Year	64.1	6.8	6.2	228+	147+	99+

* Period 1956-64 + Rounded off to whole number 0+ denotes less than 0.5

Table 6 - Average Annual Rainfall in Inches - Period 1916-50

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
BALLANTRAE 15 ft.	4.86	2.93	2.67	2.32	2.67	2.71	3.37	3.67	4.11	4.95	4.59	4.90	43.75
GIRVAN 100 ft. (GLENDOUNE GDNS)	4.95 *11.3	2.96 6.7	2.73 6.2	2.35 5.3	2.67 6.1	2.70 6.1	3.42 7.8	3.69 8.4	4.11 9.3	5.00 11.4	4.55 10.4	4.84 11.0	43.97
COLMONELL 170 ft. (KNOCKDOLIAN CAS)	5.01 *11.5	2.95 6.7	2.64 6.0	2.28 5.2	2.51 5.7	2.60 5.9	3.19 7.3	3.53 8.1	4.09 9.4	5.01 11.5	4.68 10.7	5.24 12.0	43.73
GLENLEE 181 ft.	7.38	4.63	3.91	3.36	3.66	3.24	4.33	4.81	4.99	6.67	6.37	6.73	60.08
BARGRENNAN 360 ft.	6.97	4.28	3.75	3.63	3.45	3.33	4.40	4.88	5.47	6.72	6.19	6.42	59.49
FORREST LODGE 500 ft.	9.31	5.74	4.77	4.40	4.40	4.17	5.14	5.67	6.56	8.35	7.83	8.20	74.54
CLATTERINGSHAW 585 ft.	10.09	6.31	5.33	4.75	5.00	4.35	5.90	6.89	7.13	8.94	8.53	8.77	81.99
CARSPHAIN 590 ft.	7.42	4.54	3.77	3.47	3.47	3.47	4.18	4.54	5.32	6.75	6.27	6.57	59.77
LOCH DEE 800 ft.	10.75 *12.3	6.64 7.6	5.59 6.4	5.33 6.1	5.24 6.0	4.63 5.3	6.20 7.1	7.16 8.2	7.77 8.9	9.71 11.1	9.17 10.5	9.17 10.5	87.36
LAGAFATER LODGE 800 ft.	7.24	4.37	4.05	3.47	3.85	3.92	4.95	5.33	6.04	7.17	6.67	7.17	64.23
LOCH BRADDON 970 ft.	8.37	4.91	4.29	3.94	3.87	4.08	5.05	5.33	6.51	8.03	7.27	7.55	69.20

* Percentages of the annual average.

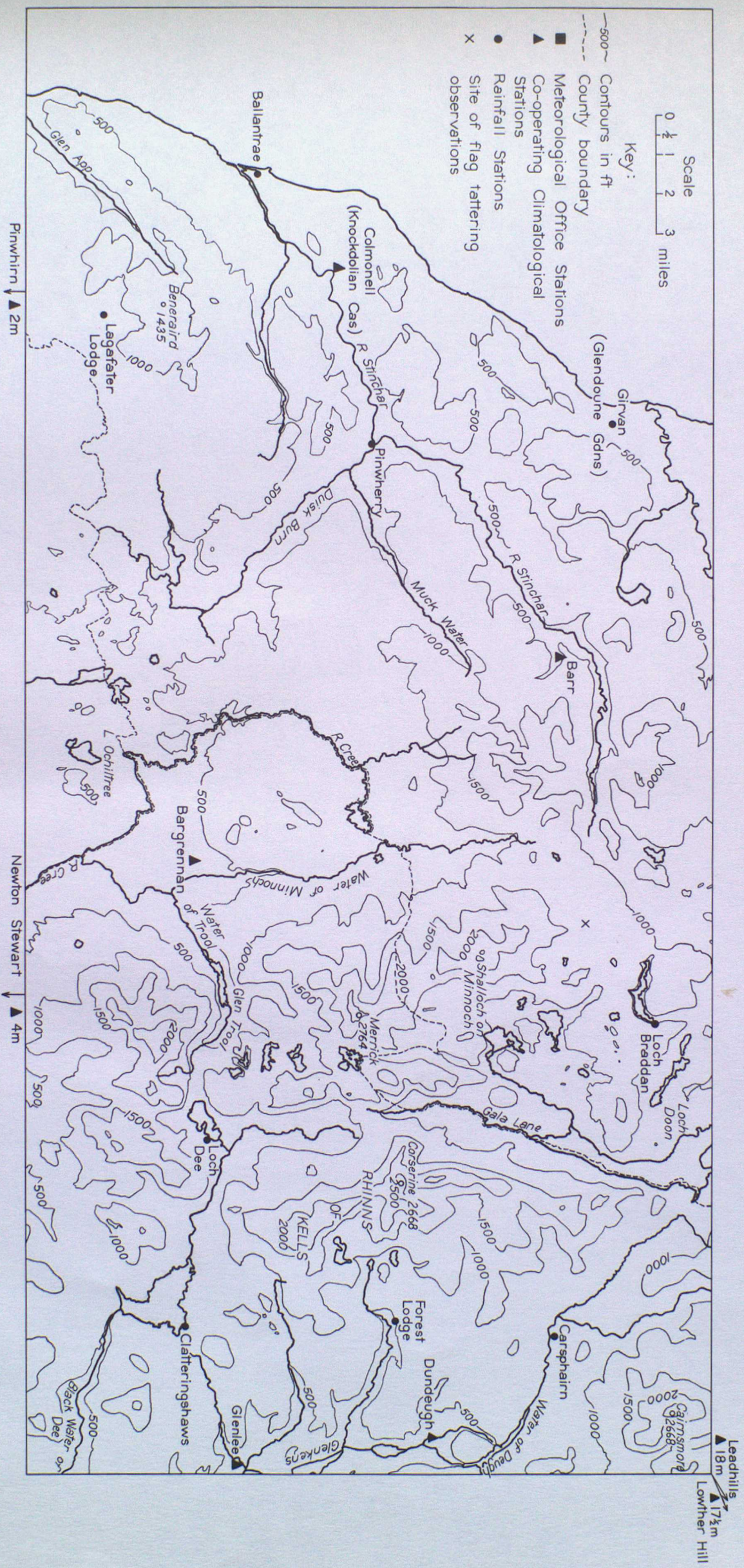
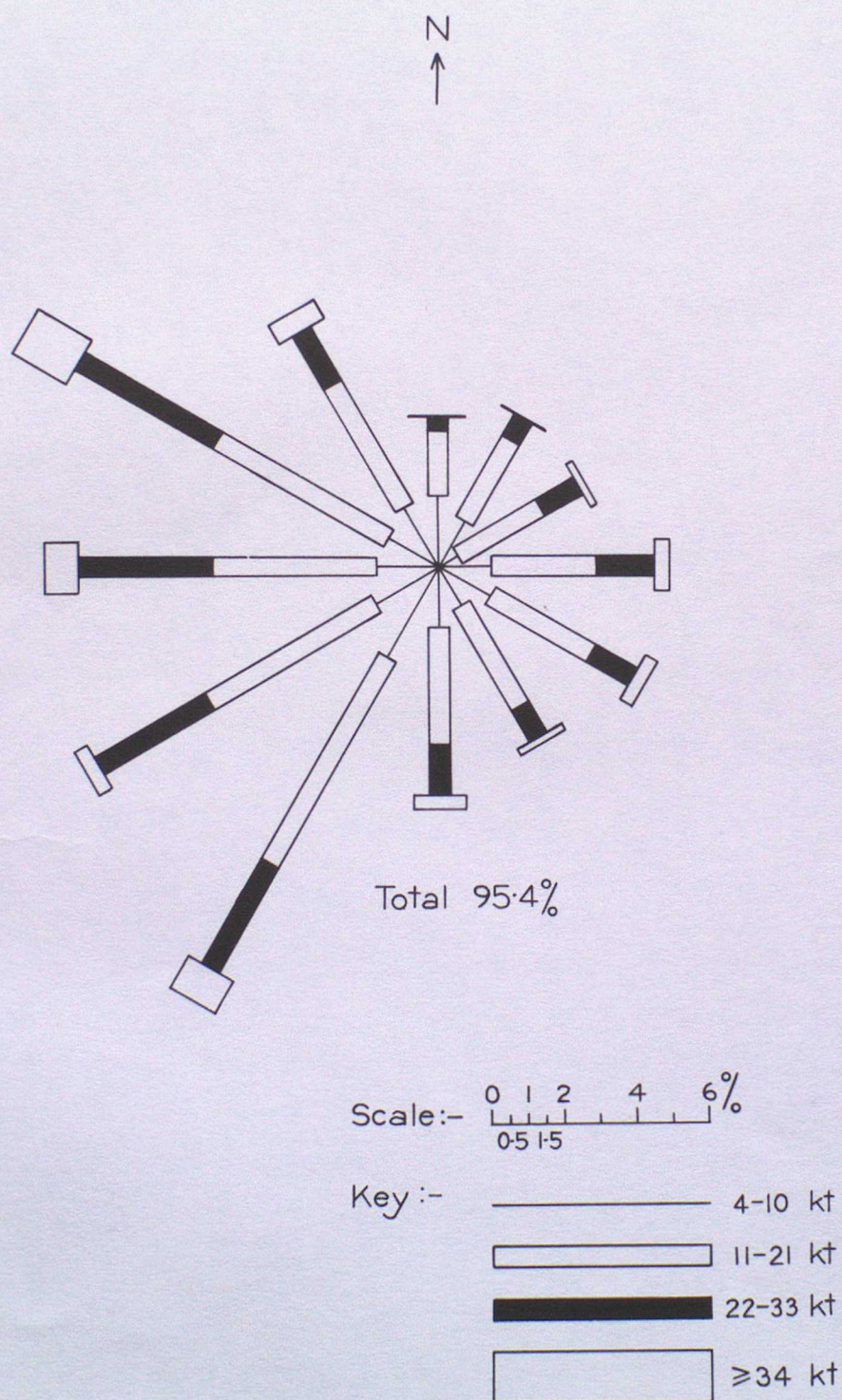


Fig 1. South-west Ayrshire and North Kirkcudbrightshire

Fig 2 LOWTHER HILL LANARKSHIRE
 Lat $55^{\circ}23'N$ Long $03^{\circ}45'W$
 Height above M.S.L 2373 ft

Annual frequencies of hourly winds exceeding 3kt July 1961-June 1965



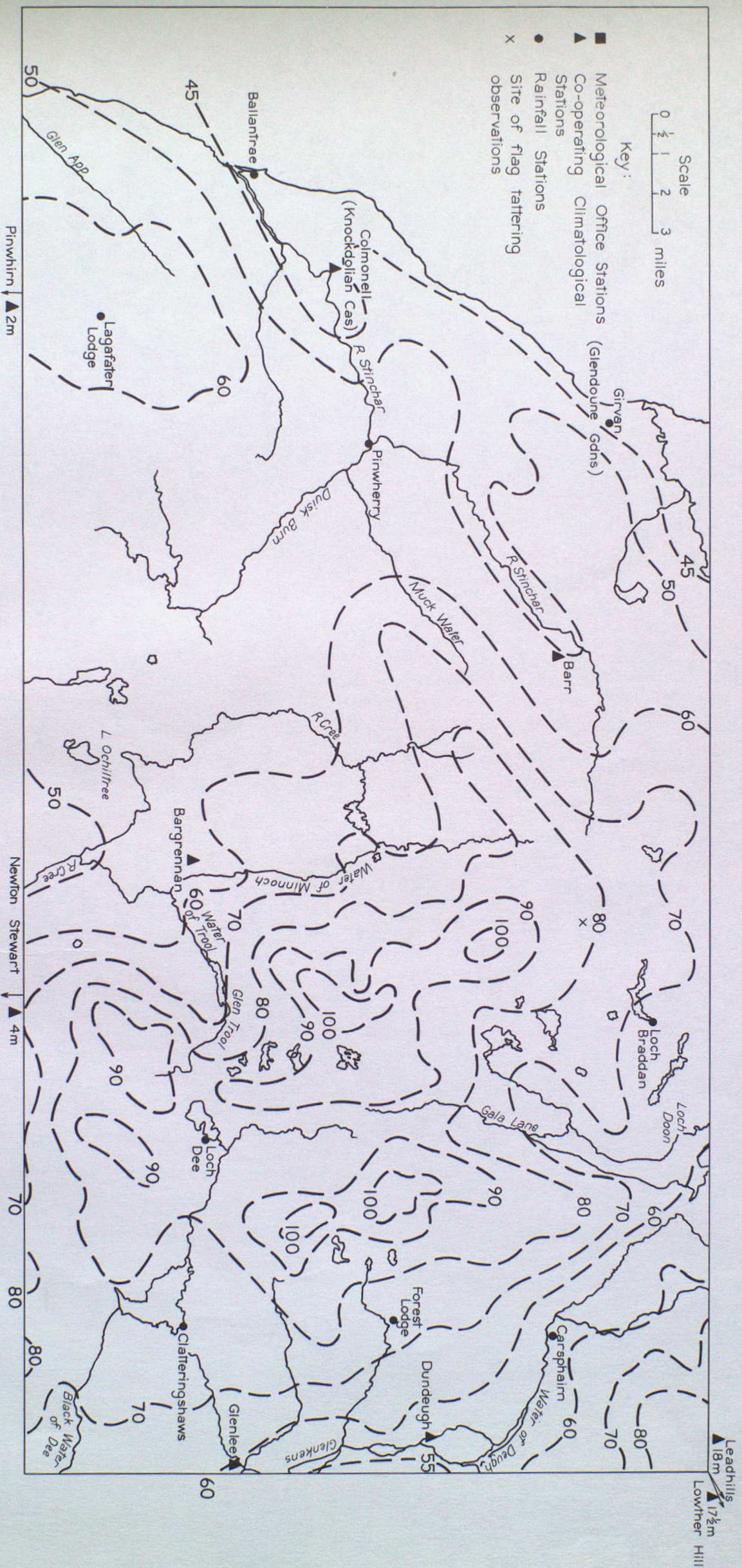


Fig 3 Average Annual Rainfall(Inches) for the period 1916-50 over South-west Ayrshire and North Kirkcubrightshire

Met. O/ Carto/D.O/917.