

Type 114.

Number of cases month by month (January to May and October to December): 11,18,6,18,15;19,13,15. This implies that type 114 is relatively infrequent; the means and frequencies obtained are quite uncertain in the case of March and somewhat uncertain during some, at least, of the remaining months.

Type 114 is strongly anticyclonic, with mainly NE winds at surface and N winds at the 500 mb level. Winds are generally light to moderate - in the interior and in the far NW very light. Gales are unusual, except at Vestmannaeyjar. Below an inversion layer, which is often well-developed in the winter half-year, temperatures are low during winter (November to February), near normal or moderately low in March - May and October. There is a marked or even extreme prevalence of bright weather in S Iceland, whereas cloudiness is not far from normal in N and NE coastal areas. For Iceland as a whole, type 114 is extremely dry; in the NE, however, precipitation deficits are moderate, except during April and May.

Pressure and winds: Winds at the 500 mb level are northerly, with a more or less well-marked anticyclonic curvature which implies an easterly component of upper winds S of Iceland. Winds at the surface are generally northeasterly and mostly light. On some of the monthly maps, the centre of an anticyclone - which may or may not be the main centre of an extensive blocking high - is located over or near N Iceland, giving variable winds near the N coast, and in April - May favourable conditions for sea-breeze circulations in that area. In S Iceland, on the other hand, winds are more consistently between E and NE, and occasionally they are moderately strong at some coastal stations. Gale frequency - defined for the present purpose as the probability of a wind velocity of 30 knots or more at one or more of the four synoptic hours (03,09, 15 and 21 GMT) selected to represent the 24-hour period under consideration - is as low as 3.2% for the country as a whole. With very few exceptions, all gales recorded at the stations selected for the investigation were from the sector N-E (N and E included).

Temperature. The mean relative topography of the 500 mb surface is close to the all-type normal most of the winter half-year, and well above that normal during April and May. The type is, however, characterized by the regular occurrence of subsidence, leading over land-covered areas to the dissipation of clouds and the formation of a temperature inversion, which may be very well-developed and in the winter months is usually maintained throughout the day. At the same time, the vertical wind shear indicates a weak or moderate advection of cold air in the lower troposphere. The result of these processes is, at the surface, a moderate or rather strong temperature deficiency, with a well-marked difference between areas with onshore winds (where temperature deviations are smaller) and all other areas. The largest deficiencies are generally found in the interior of NE Iceland. They reach -6° in January, -7 in February, -6 in November and -5 in December. They are much less, -1 to -3° , not only during April and May, when high day temperatures in the interior might be expected to compensate for severe night frosts, but also during March and October. However, as far as the figures for March are concerned, confidence is low because as little as 6 days of that month belong to type 114. (The mean date of these 6 cases is 13 March, which could not explain the relatively high mean temperature obtained.)

Small positive departures, 0 - $+1^{\circ}$, are found in parts of W Iceland during April and more generally in October, when not only nearly all coastal stations but also a large part of SW Iceland is slightly warmer than normal.

A striking contrast in May between Hornbjargsviti (-2.6) and Þórustaðir (-0.6) is probably a cloudiness effect, see below.

As the weather situation corresponding to this type is a quiet one, and as clear skies are frequent over W, S and central Iceland, it might perhaps be thought that the difference between maximum and minimum temperatures, as analyzed on map no 5, simply represents the periodic diurnal amplitude of the temperature. The diurnal amplitude is, however, - even when clear skies and light winds prevail - negligible in December and very small during November and January. This might seem incompatible with the maps which show

maximum "amplitudes" (or rather max.-min. differences) of the order of 6-8° in the interior of Iceland during all months (locally 9-10° in April). What is shown by the maps is essentially the thermal effect of such variations of cloudiness (and possibly wind velocity) as may be expected to occur quite frequently in Iceland even in anticyclonic weather situations. Although such variations are not particularly frequent in interior areas, their effect is generally larger here, because of the stronger development of temperature inversions.

Cloudiness. As mentioned above, this anticyclonic weather type is generally characterized by a marked tendency for dissipation of clouds, mainly over land areas. Even on the coast of NE Iceland, mean cloud amounts are hardly above respective monthly average values, and in almost all other parts of Iceland cloudiness is markedly deficient; some monthly means for this type are among the lowest found for any type in any part of the country, e.g. in January 2.2 oktas in Reykjavík and 2.0 in Síðumúli, in April 2.2 oktas in Reykjahlíð, in November 2.7 in Kirkjubæjarklaustur and Keflavík. The mean values obtained for March are relatively high but, considering the small number of observations on which they are based, probably not representative.

Strong contrasts are shown by the cloudiness maps in eastern Iceland (between Dalatangi and Teigarhorn), and during some months in the NW peninsula, between Hornbjargsviti and Þórustaðir:

	Mean cloudiness (oktas), type 114								Mean for 8 months
	J	F	M	A	M	O	N	D	
Dalatangi	7.0	5.2	6.1	6.1	6.7	6.6	6.8	4.9	6.2
Teigarhorn	5.2	3.5	3.7	3.9	5.3	4.2	4.3	3.6	4.2
D - T	+1.8	+1.7	+2.4	+2.2	+1.4	+2.4	+2.5	+1.3	+2.0
Hornbjargsv.	5.7	5.8	6.8	5.6	7.0	5.3	5.8	5.3	5.9
Þórustaðir	3.2	5.5	6.2	3.6	3.9	4.4	4.7	4.5	4.5
H - Þ	+2.5	+0.3	+0.6	+2.0	+3.1	+0.9	+1.1	+0.8	+1.4

As for the difference D - T, the maps showing surface pressure indicate - when taking into account the effect of friction - that Dalatangi and Teigarhorn are very nearly on the same "mean streamline". The passage over the relatively high mountains between the fjords of E Iceland (S of Seyðisfjörður) is, according to this evidence, sufficient to cause the dissipation of low clouds in a significantly large number of cases.

The particularly large difference H - D in May probably reflects the fact that during this part of the year a layer of low clouds may often prevail on the shores of Húnaflói, whereas such clouds are often dissolved before noon in many areas in northwestern fjords, as in Þórustaðir, in which case a sudden rise in temperature is generally observed (mean temperature deviation in May for type 114: Hornbjargsviti -2.6, Þórustaðir -0.6)

Precipitation. Type 114 is a very dry type. In large parts of W and S Iceland virtually no precipitation occurs when this type prevails; in NE Iceland, most of the months receive between 10 and 50% of the monthly amounts which would have been measured if ^{the} precipitation of each month were evenly distributed over all days of the month. As far as dryness is concerned, April is outstanding. During that month one station (Vestmannaeyjar) receives 22, another (Grímsstaðir) 14 and three stations in NE Iceland appr. 10 but all other stations less than 10% of the "normal" amount. In absolute figures, the total amount accumulated on (18) April days referred to type 114 was 0 or 0.0 at the following stations: Síðumúli, Þórustaðir, Hlaðhamar, Teigarhorn and Eyrarbakki, and equal to or less than 0.5 mm at seven additional stations. The total number of cases where a station received a monthly amount $\geq 50\%$ of the normal precipitation was only 13: 3 in January, 1 in March (Reykjahlíð: 138%, but see above as to the representativity of the figures for March), 1 in October (Dalatangi: 167%, resulting almost entirely from three cases giving 57, 42 and 25 mm respectively), 5 in November (Akureyri: 113%) and 3 in December.

Obviously, the number of days with precipitation was low almost throughout, and in many cases exceedingly low. Here, too, April is found to be more extreme than any other month. Only in October and December, more than half of the stations received as much as 1.0 mm on 10% or more of the days referred to type 114.

Type 114 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values (the latter obtained by taking the average values for all types):

	J	F	M	A	M	J	J	A	S
Rel. top.	523	526	523	536	537	541	523	529	
Departure	+1	+2	-1	+8	+4	+6	-3	+6	

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar(8) ⁺)	Lambavatn (8)
Dalatangi (6)	Reykjahlíð (8)
Fagurhólsmýri (6)	Þórustaðir (7)
Hveravellir (5/7)	Hallormsst.(7)
	Grímsstaðir(5)

C. Frequency and direction of gales ("maximum wind" ≥ 30 knots).

Sum of possible number of days with a gale:
 $23 \times 115 - 69 = 2576$.
 Actual number of days with a gale:

$$83 = 3.2\%$$

Distribution as to direction:

1	13	10	
.		30	
1		22	
1		5	
.	.	.	

(E.g.: 22 cases of an easterly gale, wind direction 80-100°, were reported.)

⁺) In tables B, E, F and G the figures within parentheses indicate the number of months (among a total of 8) when a particular station belongs to a group of (usually) 5 stations deviating from the majority of stations as stated in the heading of the table concerned. Two figures (as for instance 5/7) are used when the number of months for which adequate data were available was less than 8.

D. Severe gales.

The only case referred to type 114 when a wind velocity exceeding 50 knots was reported was 4 February 1963 when a wind of 20° 59 knots was registered at Vestmannaeyjar.

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Raufarhöfn (7) ^{+))}	Síðumúli (8)
Hornbjargsv.(6)	Kirkjub.kl.(5)
Grímsey (6)	
Dalatangi (6)	

H. Large daily amounts of precipitation (≥ 40.0 mm).

Only two such cases occurred, both of them in October and both at Dalatangi:

1 Oct. 1958	57.0 mm
8 " 1960	41.6 "

E. Stations whose anomalies of monthly mean temperature, when compared with those of other stations, make them appear

warm	cold
Vestmannaeyjar(7) ^{+))}	Grímsstaðir(7)
Lambavatn (5)	Reykjahlíð (6)
	Síðumúli (5)
	Hallormsst.(5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts - in comparison with corresponding figures for other stations - appear as

large	small
Raufarhöfn(7) ^{+))}	Hæll (6)
Akureyri (5)	Eyrarbakki(6)
Reykjahlíð(5)	Keflavík (5)
Dalatangi (5)	Reykjavík (5)
	Hlaðhamar (5)

^{+))} See note on previous page.

Type 115.

Number of cases month by month: 15,26,21,20,25;18,25,23. For most of the months the mean values and frequencies discussed below may, on the whole, be considered as representative, but some reservation may be necessary as regards January, and possibly October.

Type 115 is characterized by N or NE wind at the 500 mb level and NE - sometimes rather strong - winds at the surface. The advection of cold air is associated with a moderately large temperature deficiency at station level and in the lower troposphere. A marked contrast in weather exists between NE Iceland, having cloudy or overcast skies with normal or above-normal precipitation, and the other parts of the country where the weather is generally dry and, in the SW at least, mostly bright.

Pressure and winds. Winds at the 500 mb level are northerly or northeasterly. The maps show some differences between the various months, November and December having no E component whereas February has a rather straight NE flow and October a NE flow with a cyclonic curvature, but such details may not be fully representative. The geostrophic wind at the earth's surface is mostly NE or ENE, and rather stronger than that at 500 mb; the curvature of the isobars is anti-cyclonic, at least over N Iceland and the adjacent sea. Pressure tendencies are generally positive, indicating that a surface high, probably centred over Greenland, is either intensifying, approaching Iceland, or both. N, NE and E gales are relatively frequent at the E and S coast; they may occur in other parts of the country, too, as indicated by the relatively high level of some monthly means of the "maximum wind" at several coastal stations, e.g. Reykjavík, Stykkishólmur and Hraun. The overall mean frequency of gales (see Supplement) is moderately high: 8.8%. More than 90% of all gales were from the NE quadrant (including N and E) and nearly all remaining cases were from NNW or ESE.

Temperature. Generally speaking, type 115 is moderately cold with temperature departures mostly between -1 and -4°. Larger deficiencies prevail in some areas, mainly in the interior, during December (Síðumúli -5.8) and January (Eyrarbakki -5.1). Some southern stations, on the other hand, have temperatures near normal during February (Fagurhólsmýri +0.2) and even a little above normal in October (Teigarhorn and Fagurhólsmýri +1.0). The true differences between January and

February are probably less than those which may be obtained from the maps, and the relatively high mean temperatures for October may not be fully representative.

As regards January and February, it may be seen from the Supplement (table A) that the relative topography of the 500 mb surface for these two months is 511 and 518 geopotential dekameters, respectively, indicating a mean temperature difference of the layer between 1000 and 500 mb of 3-4° (January colder). Here, too, it seems likely that an extension of the reference period to 30 years or more would reduce the difference found between the two months.

The relatively high temperatures in SE Iceland are probably caused partly by the long trajectory of the surface air across open water to the NE of Iceland, partly by a foehn effect as mentioned in the following section.

The differences between maximum and minimum temperature, as seen from the maps labelled no 4, are about as large as might have been expected: generally 5-7° in some interior districts and 3-5° at most coastal stations. The differences are - as might also have been anticipated - larger in May than in autumn and winter, except along the N and E coast where the largest values occur in January (possibly reflecting the effect of progressive cooling due to the cold-air advection which is well-marked during this month). The high values given for Eyrarbakki are probably not representative for a wider area, but there is a tendency - most clearly seen in April, May and October - for relatively larger max.-min. differences to occur in SW Iceland where the overland trajectory is larger than elsewhere.

Cloudiness. The contrast between NE and SW Iceland with respect to cloudiness is striking, as seen from the following table.

Mean cloudiness (oktas)	J	F	M	A	M	O	N	mean for 8 months	
A: NE Iceland(7 stations)	7.5	6.6	6.9	6.2	6.1	7.6	7.1	7.1	6.9
B: SW Iceland(6 stations)	4.6	3.4	3.6	3.9	4.6	4.1	3.5	2.8	3.8
Difference (A-B)	+2.9	+3.1	+3.3	+2.3	+1.5	+3.5	+3.6	+4.3	+3.1

The stations selected for the computation of these mean values were: for A, Grímsey, Akureyri, Reykjahlíð, Grímsstaðir, Raufarhöfn, Hallormsstaður and Dalatangi; for B, Kirkjubæjarklaustur, Vestmannaeyjar, Eyrarbakki, Keflavík, Reykjavík and Síðumúli.

The difference for December (4.3 oktas) is excessive and is hardly equalled by any other type.

It may be assumed, when judging from the general flow pattern, that the clouds which are so dominant in NE Iceland when type 115 occurs, are generally low clouds, formed under an inversion which separates moist air from overlying, gradually subsiding, drier air which may often be very dry. The low clouds are broken up gradually when entering the mountainous parts of E and N Iceland; a regular foehn effect plays an important role in the process by which the clouds are dissipated.

In the NW peninsula, Hornbjargsviti has a high value of the mean cloudiness (mean for 8 months: 7.0 oktas), whereas the value for Lambavatn is low (4.0). It may be observed that Þórustaðir agrees rather closely with Lambavatn during April and May but otherwise shows values more similar to those valid for Hornbjargsviti.

The contrast between Dalatangi and Teigarhorn is of the same order of magnitude as for type 114 and, as in that case, largely due to a foehn mechanism which affects the air moving across the easternmost part of Iceland. The mean value for 8 months is 7.1 for Dalatangi and 5.0 for Teigarhorn.

Precipitation. As for cloudiness, there is a marked contrast between NE Iceland and most other parts of the country. S and W Iceland is generally dry: less than 10% of "normal" precipitation is reported from a rather large area during each of the 8 months. In NE Iceland, type 115 gives abundant precipitation during October, November, December and January, whereas the four subsequent months generally show percentage values ranging from 50 to 150 in this part of the country. The tendency towards an annual variation regarding the relative "wetness" of this type in NE Iceland may be considered as well substantiated and probably reflects the effect of labilization of the arctic air moving S or SW across open water: the labilization is enhanced by high sea temperature, and may be less effective during late winter and spring if the southern limit of sea polar ice is then closer to Iceland.

The maps illustrating precipitation frequencies are, broadly speaking, similar to those showing relative amounts of precipitation. Thus, each of the monthly maps shows a large or at least fairly large area in the SW where less than 10% of all days receive as much as 1.0 mm of precipitation, whereas the corresponding frequency in the area of maximum precipitation in NE Iceland varies from about 40 or 50% in March, April and May to 70% or more in the months October through January. In May, however, the dry area extends over nearly the whole of Iceland, at least as far as precipitation frequency is concerned: of the stations used for the present analysis only one, Dalatangi, has a May frequency of more than 25% of days with a precipitation of 1.0 mm or more.

A closer inspection of the frequency maps reveals that the daily amounts associated with type 115 are usually between 1 and 5 mm at such stations as Grímsey, Raufarhöfn, Akureyri, Reykjahlíð, Grímsstaðir and Hallormsstaður. Dalatangi shows a somewhat different picture, with a fairly high frequency of amounts larger than 5 mm during some of the months: 52% in November, and - more surprisingly - 32% during May which is otherwise a dry month even in the E part of the country. Dalatangi is also the only station where daily amounts exceeding 40 mm have occurred on days referred to type 115 (see Supplement, table H).

Type 115 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	511	518	519	522	531			531	519	516		
Departure	-11	-6	-5	-6	-2			-4	-7	-7		

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar (8)	Þórustaðir (8)
Dalatangi (7)	Reykjahlíð (8)
	Grímsstaðir(8)
	Akureyri (6)
	Hallormsst.(6)

C. Frequency and direction of gales ("maximum wind" \geq 30 knots).

Possible number of cases:

$$23 \times 173 - 94 = 3885.$$

Actual number of days with a gale:

$$341 = 8.8\%$$

Distribution as to direction:

	1	68	67	
-				141
.				42
1				10
.		1	2	

D. Severe gales.

A wind velocity \geq 60 knots was observed on one occasion only:

2 April 1968: Vestmannaeyjar
20° 60 knots.

There were 12 more cases where a maximum wind velocity \geq 50 knots was reported: one at Lambavatn, one at Fagurhólsmýri and 10 at Vestmannaeyjar.

E. Stations whose anomalies of monthly mean temperature make them appear as

warm	cold
Fagurhólsmýri (7)	Grímsstaðir (8)
Teigarhorn (6)	Hveravellir(6/6)
Kirkjubæjarkl.(6)	Eyrarbakki (6)
	Síðumúli (5)
	Reykjahlíð (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Raufarhöfn (7)	Síðumúli (8)
Hornbjargsv.(6)	Kirkjub.kl(5)
Grímsey (6)	
Dalatangi (6)	

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Raufarhöfn (7)	Hæll (6)
Akureyri (5)	Eyrarbakki (6)
Reykjahlíð (5)	Keflavík (5)
Dalatangi (5)	Reykjavík (5)
	Hlaðhamar (5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

Only three cases were reported. All of them occurred at Dalatangi:

31 Jan. 1966	Dalatangi	44.7 mm
13 Oct. 1977	"	49.5 "
27 Nov. 1968	"	45.6 "

Type 116

Number of cases month by month: 18,25,26,19,20;24,26,19.
Broadly speaking, the mean values and frequencies discussed below may be considered as fairly representative.

At the 500 mb level, type 116 is characterized by the presence of a rather deep cut-off low centred near SE Iceland. At the surface, winds are northeasterly and often strong. The advection of arctic air in the rear of the European surface low has led to generally cold weather, but the wind is usually too strong to give particularly low temperatures. As with other types where winds are northeasterly, the weather is usually cloudy or overcast in the NE, but mostly bright in S and SW Iceland. The geographical contrasts with respect to precipitation are very great: NE Iceland receives frequent and often large amounts, whereas the southwestern parts of the country, from the Breiðafjörður area to Vatnajökull, usually have dry, partly very dry weather .

Pressure and winds. All 500 mb maps indicate the existence of a cut-off low either over the sea SE of Iceland or (in November) N of the Faroes. Whereas the gradient on the 500 mb maps is weak to moderate, the surface maps show a strong gradient, with pressure differences between Hornbjargsviti and Höfn varying from 9 mb in May to as much as 16 mb in January. (It may, of course, be less than 9 mb in summer.) The strong NE winds accompanying this pressure distribution have, according to the monthly maps, an anticyclonic curvature over most of Iceland; in some cases a slight tendency to cyclonic curvature is found in the extreme SW, probably an effect of the topography of SW Iceland. As might be expected because the type is characterized by a low value of the 500 mb surface at 0 GMT, the pressure tendencies - representing the change from 3 to 15 GMT - are positive, and fairly large, on all the monthly maps. This may be due to an eastward movement or a filling of the surface low (probably located over the Norwegian Sea in most cases), or both.

It follows from the differences with respect to gradient and curvature at the surface and the 500 mb level that the lowest mean temperatures of the layer between 1000 and 500 mb are found over Iceland or in the far NW, not to the NE of Iceland. This in its turn implies that cold-air advection still taking place over SW Iceland is being replaced by weak or moderate warm-air advection in the NE part of the country, presumably by air which has entered the circulation of the large vortex via Scandinavia.

Type 116 is characterized by high values of "mean max wind" and a high frequency of gales. The mean max. values for this type are among the highest obtained for any type, particularly in northern Iceland; in almost one third of the total number of cases, type 116 has a higher "mean max wind" value for the station concerned than any other type. The values for Stykkishólmur, Jan. (29 knots) and Dec. (30 knots) are particularly high. The overall mean frequency of gales (see Supplement) is 21.2%, one of the highest values ^{obtained} by any type. More than 90% of all gales are from the NE sector (N and E included), and 3/4 of the remaining cases are from NNW. Gales are frequent not only at coastal stations which are particularly exposed to NE winds, but at nearly all other coastal stations, too, and rather frequent at some stations in the interior. As mentioned in the Supplement, a few severe and widespread gales took place on days referred to type 116.

Temperature. The departures from the normal temperature of the month concerned are mostly between -2 and -4°. They are relatively small, mostly 0-1°, in October, but large in November (generally -3 to -5) and March (-4 to -5). The regional differences are not very striking, but broadly speaking the western half of the country is relatively cold and the coastal strip of SE Iceland relatively mild, as might be expected in view of the general flow pattern shown by maps no.2.

The difference shown by ^{the} figures for October and November is probably not fully representative, but the low values of March may be so. The mean values of the 500 mb relative topography for February, March and April all indicate a mean temperature deficiency of 6-7° in the lower half of the troposphere, which agrees fairly well with the departures of -2 - -5° obtained for these months at most Icelandic stations.

The differences between maximum and minimum temperatures are generally between 3 and 5° along the coast and between 4 and 6° in the interior. The highest values, 7-8°, are found in the southernmost part of the country during May. They indicate that in this area, with broken skies, day temperature at this time of the year may be relatively high while night frosts are still rather frequent.

Cloudiness. As for other types with predominantly NE winds, the contrast between northern and southwestern Iceland with respect to cloudiness is striking:

Mean cloudiness(oktas)	J	F	M	A	M	O	N	D	Mean for 8 months
A: North coast	7.6	7.7	7.2	7.2	7.4	7.6	7.7	7.8	7.5
B: SW Iceland	4.5	3.9	4.3	4.6	4.7	5.0	3.9	4.1	4.4
Difference (A-B)	3.1	3.8	2.9	2.6	2.7	2.6	3.8	3.7	3.1

The stations selected for the computation of these mean values were: for A, Raufarhöfn, Grímsey, Hraun and Hornbjargsviti; for B, Kirkjubæjarklaustur, Vestmannaeyjar, Eyrarbakki and Reykjavík.

On a smaller geographical scale, similar contrasts are found between Hornbjargsviti (mean for 8 months: 7.6 oktas) and Lambavatn (mean: 5.1 oktas), as well as between Dalatangi (mean: 7.2 oktas) and Teigarhorn (mean: 5.3 oktas).

A discussion of the physical processes leading to the large differences mentioned above is given in the text dealing with type 115 (section Cloudiness).

Precipitation. Type 116 is very wet in NE Iceland and generally very dry in the SW, which may in this instance be taken to mean all inhabited land from the Breiðafjörður area to Vatnajökull. The contrasts are thus very large, and they are, as shown by the following table, highly persistent from month to month, except from April to May:

Mean amount of precipitation (in mm and in % of its "normal" value) for two groups of stations, as specified below.

	J	F	M	A	M	O	N	D	8 months
(A) NE Iceland, mm	5.2	4.1	3.3	4.0	2.5	6.4	5.1	6.1	36.6
" " , %	248	241	220	174	250	291	243	277	242
(B) SW Iceland, mm	0.3	0.3	0.2	0.2	0.9	0.8	0.2	0.2	3.1
" " , %	9	9	8	8	40	19	5	5	12

The stations selected for obtaining the mean values given above were: for (A), Grímsey, Akureyri, Reykjahlíð, Grímsstaðir, Raufarhöfn, Hallormsstaður and Dalatangi; for (B), Lambavatn, Reykjavík, Kirkjubæjarklaustur, Hæll, Eyrarbakki and Keflavík.

Beyond the general distribution mentioned above, the monthly maps show few significant details. Most interesting among these is the distribution of precipitation in the northwestern peninsula: Lambavatn is (as indicated) dry throughout the 8 months, whereas Þórustaðir receives about 50% of the normal amount during January, February and March and mostly 100-150% during the remaining five months, and the relative amounts for Hornbjargsviti show large variations, from less than 50% in March to almost 400% in May. It may be noted that of the total amount for May at that station (171 mm), as much as 105 mm or 61% fell during three consecutive days, 16-18 May 1962.

The maps no.8, showing the relative frequency of precipitation days, convey the same general picture as the maps no.7. Striking contrasts are found between NE and SW Iceland. On the east coast, the number of precipitation days in Dalatangi is more than twice the number at Teigarhorn :

Dalatangi, precipitation days (type 116)									
(Total number of days)	J (18)	F (25)	M (26)	A (19)	M (20)	O (24)	N (26)	D (19)	8 months 177
≥ 0.1 mm	17	25	24	19	19	21	26	18	169 (95%)
≥ 1.0 "	13	21	16	16	12	19	22	17	106 (60%)
≥ 5.0 "	8	10	5	7	8	16	14	14	82 (46%)
≥ 10.0 "	6	3	1	6	3	9	7	11	46 (26%)
≥ 20.0 "	2	1	1	3	2	1	2	2	14 (8%)
Teigarhorn, precipitation days (type 116)									
≥ 0.1 mm	9	7	11	11	4	14	9	7	72 (41%)
≥ 1.0 "	7	6	6	9	4	12	8	6	58 (33%)
≥ 5.0 "	2	3	6	3	1	8	4	4	31 (18%)
≥ 10.0 "	1	0	3	1		5	2	3	15 (8%)
≥ 20.0 "	1		1	1		3	1	2	9 (5%)

Thus, the number of days with at least 5 mm of precipitation in Dalatangi is greater than the number of days having at least 0.1 mm in Teigarhorn. It is interesting to note, however, that the average amount per day with precipitation (≥ 0.1 mm) is not very different: 7.7 mm in Dalatangi, 7.0 mm in Teigarhorn.

Type 116 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. top.	518	511	510	516	524		530	514	514
Departure	-4	-13	-14	-12	-9		-5	-12	-9

B. Stations where the "mean maximum wind" is relatively high

Vestmannaeyjar(8)	Pórustaðir (8)
Stykkishólmur (7)	Hallormsst.(8)
Hornbjargsviti(6)	Reykjahlíð (6)

C. Frequency and direction of gales ("maximum wind" \geq 30 knots).

Possible number of cases:

$$23 \times 177 - 104 = 3967$$

Actual number of days with a gale:

$$841 = 21.1\%$$

Distribution as to direction:

	49 233 239	
1	<div style="border: 1px solid black; width: 40px; height: 40px; display: inline-block;"></div>	267
3		35
•		7
•	1	6

D. Severe gales.

A wind velocity \geq 60 knots was observed in four cases at Vestmannaeyjar (14 February 1973, 29 April 1972, 24 Nov. 1961 and 12 Nov. 1970) and once at Teigarhorn (29 April 1975). The wind direction was 340-360° in all five cases, and the highest wind speed, 68 knots, was recorded in the February case. Gales were particularly widespread in this case; on two further occasions (17 March 1968, 10 Nov. 1969) they were equally widespread but not quite as severe.

E. Stations whose anomalies of monthly mean temperature make them appear as

warm		cold	
Fagurhólsmýri (8)		Þórustaðir (7)	
Teigarhorn (8)		Hornbjargsv.(6)	
Dalatangi (7)		Eyrarbakki (5)	
Kirkjubæjarkl.(6)		Síðumúli (5)	
Raufarhöfn (6)			

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large		small	
Akureyri (8)		Reykjavík (8)	
Raufarhöfn (8)		Hæll (6)	
Reykjahlíð (8)		Lambavatn (5)	
Grímsstaðir(8)		Kirkjubæjarkl.(5)	
		Eyrarbakki (5)	
		Keflavík (5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high		low	
Grímsey (8)		Kirkjub.kl.(8)	
Raufarhöfn (7)		Vestmanna.(8)	
Hornbjargsv.(6)		Reykjavík (8)	
Hraun (5)		Eyrarbakki (6)	

H. Large daily amounts of precipitation (≥ 40.0 mm). The following four cases were reported:

10 Jan.1962	Hornbj.v.	46.5 mm
21 Mar.1968	Vestm.e.	60.1 "
17 May 1962	Hornbj.v.	54.7 "
7 Oct.1976	Dalatangi	47.1 "

Type 124.

Number of cases month by month: 20,16,23,15,19;19,17,15. For most of the months, the number is rather small, and some caution is required as regards the representativeness of the monthly means and frequencies discussed below. On the other hand, 124 is a rather quiet type with small or moderate variations between the days referred to it (except as regards precipitation in SE Iceland), and the representativeness may be better than the frequency numbers seem to indicate.

As far as the 500 mb circulation is concerned, type 124 is strongly anticyclonic, with a blocking high situated over NE Iceland or at some distance to the N or E of that area. A surface high is usually located NE of Iceland, but the anticyclonic curvature is mostly less marked at the earth's surface than in the middle of the troposphere. Gales are frequent at Vestmannaeyjar, but otherwise infrequent almost everywhere. Temperature deviations are positive almost throughout in S and W Iceland, without being very large; in E and N Iceland they are more variable, with negative departures occurring during five of the eight months concerned. Cloudiness is, on the whole, about normal in E, S and SW Iceland and less than normal elsewhere. Generally speaking, 124 is a very dry type; in large areas of western Iceland all months receive less than a third of the normal amount, and positive anomalies of precipitation amounts occur only during January and November at a few stations in E Iceland. Precipitation frequencies are low, except along the coast of S and SE Iceland where they are moderate during the period October to January and in March.

Pressure and winds. A blocking anticyclone is situated, at the 500 mb level, at or near the NE coast of Iceland (February, October, December) or somewhat N (January, May, November) or E (March, April) of that region. The corresponding surface high seems to be centred, on all mean maps, NE of Iceland, possibly as far to the NE as in the area of Jan Mayen. The anticyclonic curvature is generally less marked near the surface than at the 500 mb level, except in December; in fact, the map for May indicates -in spite of high surface pressures - a cyclonic curvature.

The gradient is weak in the area of NE Iceland, but much stronger in the coastal area of SW Iceland; for most of the months the pressure difference between Kirkjubæjarklaustur and Vestmannaeyjar (distance: 120 km) is at least as large as between Dalatangi and Kirkjubæjarklaustur (distance: 270 km). The inequality with respect to the gradient is reflected in the "mean max. wind" values: for the country as a whole, these values are rather on the low side, but at Vestmannaeyjar they are high or very high, ranging (for the eight months concerned) from 27 knots in October to 49 in January; the latter value is, in fact, the highest obtained for any type, station and month. Rather high values are also obtained for Fagurhólsmýri; as this station lies outside the area of strong gradients, the strong winds (mean max. wind in January: 33 knots) - almost exclusively from ENE - reveal a marked influence of the local topography. The mean max wind for Hornbjargsviti during March, April and May (4-7 knots) is surprisingly low.

Gale frequency is, as indicated, high at Vestmannaeyjar and rather high at Fagurhólsmýri, but low at all other stations. The wind direction reported together with a velocity ≥ 30 knots was usually E or ENE (73% of all cases), but in December most of the gales were from a southeasterly direction. The total number of days with gale (counted as one case for each station where the max. wind is at least 30 knots) is 248. Of this number, 96 occurred at Vestmannaeyjar; in exactly half of these cases, no gale was reported at any other station. On the other hand, only three cases occurred when one or more stations did report a gale and Vestmannaeyjar did not.

Several of the gales reported from Vestmannaeyjar were quite strong. A wind speed of 60 knots or more was recorded on six occasions (3 in January, 1 in March and 2 in December) from E or ESE; the highest velocity reported was 75 knots on 3. Dec. 1970.

Temperature. In the free atmosphere up to at least 500 mb type 124 is quite warm, on an average 3° (in May $4-5^{\circ}$) warmer than normal. The temperature deviations at the surface are also, with some exceptions, positive, but mostly less than 3° .

During the months January to April relatively large departures, about 3°, are found in the interior of SW Iceland, whereas the excess is less in N and E Iceland, in particular during February when some stations have approximately normal temperatures.

The temperature distribution in May is more complicated: fairly large departures in some NW, W and east-central areas (Þórustaðir +3.1, Hæll +3.4, Reykjahlíð +3.3), but negative departures in the Húnaflói area (Hornbjargsviti -1.2, Hlaðhamar -0.7, Hraun -1.2) and along the east coast from Raufarhöfn (-1.0) to Teigarhorn (-0.7). Choosing Hlaðhamar to represent the relatively cold area and Síðumúli as a representative for the rest of the country, the spectacular contrast may be illustrated by the following frequencies, valid for type 124:

	0°	2	4	6	8	10	12	14	16	18	20°	Mean value
May, max. temp.												
Hlaðhamar		3	5	0	2	4	1	3	0	1	0	7.2°
Síðumúli		0	0	0	0	1	2	4	5	5	1	14.9°
May, min. temp.	-4°	-2	0	2	4	6	8	10°				
Hlaðhamar		1	3	8	5	2	0	0				1.3°
Síðumúli		0	1	2	6	7	2	1				3.6°
Temperature difference Síðumúli (S) - Hlaðhamar (H), May												
$t_S - t_H$	-2°	0	2	4	6	8	10	12	14°			Mean diff.
Max. temp.		0	2	1	2	4	4	5	1			7.7°
Min. temp.		3	3	7	5	1	0	0				2.6°

As the tables show, the difference is on an average much larger during day than during night. The temperature frequencies for the preceding months, in particular April, show the same tendency, but not quite as strikingly as those for May.

The figures indicate that the conditions for low temperatures to persist all day (probably under a layer of Stratus cloud or in dense fog) in the Húnaflói area, whereas at the same time abundant sunshine leads to a rapid rise of temperature in the interior of W Iceland, are highly favourable during spring, and above all in May. The low water temperature - particularly in the presence of ice at or near the N coast - is a main factor in this connection.

The maps illustrating temperature departures during the autumn have most features in common: the SW parts of Iceland are mostly 1-2° warmer than normal, whereas an area in the interior of N Iceland is relatively cold, with departures of -1 to -1.5 at a few stations.

The maps no 5 show large contrast between some coastal areas, particularly in the far E and near Húnaflói, and the interior of the country: at one extreme, the mean difference between maximum and minimum temperature at Dalatangi varies only between 2.4 (November) and 4.4 (May); at the other, the following mean values of $t_{\max} - t_{\min}$ are found at Síðumúli and Akureyri: January, 6.2 and 5.1; February, 5.9 and 6.4; March, 6.8 and 7.9; April, 8.5 and 8.3; May, 10.9 and 9.0; October, 6.5 and 7.0; November, 5.4 and 4.9; December, 7.3 and 5.9. The striking contrasts between Síðumúli and Hlaðhamar in May are discussed above; similar contrasts exist between other pairs of stations, e.g. Þórustaðir and Hornbjargsviti, Hallormsstaður and Dalatangi, Eyrarbakki - by this type a "continental" station - and Vestmannaeyjar.

Cloudiness. Generally speaking, cloudiness is about normal in E, S and SW Iceland and less than normal elsewhere. The variations from month to month are in this case rather irregular and probably not all representative, but on the whole, cloudiness figures are relatively high in October, low in November and December. The difference between the N coast and the interior, already indicated in the previous section, may be illustrated by the following mean values (oktas) for April and May: Hornbjargsviti 7.0, Hlaðhamar 6.5, Raufarhöfn 6.2, but Síðumúli 4.7 and Reykjahlíð 3.5. The May value for Þórustaðir, 3.2, is remarkably low, in particular when compared with the corresponding figure for Hornbjargsviti (7.1).

Precipitation. The anticyclonic character of type 124 is clearly seen from the precipitation maps (nos 7 and 8). On all monthly maps, almost the whole of W Iceland is shown to be very dry, with amounts generally less than 25 and in many cases less than 10% of normal. This very dry area extends to the interior of E Iceland during February, October and December, and as far as the coast of NE Iceland during March and April; it comprises virtually the whole of Iceland during May, when only one station

(Stykkishólmur) has received more than 30% of the normal amount.

Outside the very dry area, amounts are generally of the order of 50-100%, but the areas receiving more than 50% are quite small in all months from February to May. Amounts exceeding 120% are reported in four cases only (Dalatangi: Jan. and Nov.; Teigarhorn: Nov.; Fagurhólsmýri: Jan.).

The maps showing precipitation frequencies add little to the picture conveyed by those which show relative amounts of precipitation. A frequency larger than 30% of a daily precipitation amount ≥ 1.0 mm is found near the E and S coast only, and mainly during January (Fagurhólsmýri: more than 10.0 mm on 5 out of 20 days), March, October, November and December. In this area, three cases occurred when a daily amount exceeded 40 mm, as specified in the Supplement.

Type 124 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

Rel. top.	527	530	531	533	542	•	542	532	532
Departures	+5	+6	+7	+8	+9		+7	+6	+9

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar (8)	Þórustaðir (8)
Fagurhólsmýri (8)	Hallormsst.(8)
Reykjavík (5)	Reykjahlíð (7)
	Hlaðhamar (5)
	Akureyri (5)

C. Frequency and direction of gales ("maximum wind" ≥ 30 knots).

Sum of possible number of days with a gale:
 $23 \times 144 - 79 = 3233$
 Actual number of days with a gale: 248 = 7.7%

D. D. Severe gales.

A wind velocity ≥ 60 knots was reported from one station only, namely Vestmannaeyjar, but on six occasions: 3 in January, 1 in March and 2 in December. In the two December cases, the wind direction was ESE (110°) and the velocity 75 knots (3 Dec. 1970) and 65 knots, respectively. In the remaining 4 cases the wind was due E (90°) and the velocity between 60 and 70 knots.

Distribution as to direction:

•	•	9
•	□	67
•	□	113
•	□	33
•	•	5 21

E. Stations whose anomalies of monthly mean temperature, when compared with those of other stations, make them appear as

warm		cold	
Hæll (8)	Akureyri (7)		
Reykjavík (6)	Hlaðhamar (7)		
Lambavatn (6)	Hraun (6)		

F. Stations whose monthly means of cloudiness, compared with those of other stations, are high low

Hornbiargsviti(5)	Reykjahlíð (7)
Dalatangi (5)	Hraun (5)
Keflavík (5)	Grímsstaðir(5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts - in comparison with corresponding figures for other stations - appear as: large small

Teigarhorn (7)	Þórustaðir (5)
Dalatangi (5)	Síðumúli (5)
	Hæll (5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

Three cases have occurred, all of them in SE Iceland:

31 Jan. 1967	Dalatangi	51.1 mm
24 " "	Fagurhólm.	44.5 "
4 Nov. 1974	Dalatangi	57.5 "

Number of cases month by month: 26,29,24,29,23;25,26,36. These numbers are fairly large, and the representativeness of the mean values and frequencies discussed below is probably rather satisfactory.

The surface maps show a moderate, in S Iceland rather strong, E wind without much curvature. At the 500 mb level the gradient is generally weaker than at the surface, which means that the high situated N or NE of Iceland is essentially a cold (and not a blocking) high. Winds are often strong at exposed places near the S coast; in January at least, they tend to be strong at some coastal stations in N Iceland, too. Gale frequency is high or very high at Vestmannaeyjar but generally moderate or rather low elsewhere. Temperature departures are usually within the interval -1 to +2 - mostly negative in May and December, but otherwise mostly positive. The easterly winds bring cloudy weather to E Iceland and, with some exceptions, along the N coast, but the clouds usually break up, partly at least, before reaching W Iceland. In agreement with this, type 125 is generally a wet type in the eastern third or so of the country, but the amounts of precipitation are smaller elsewhere and very small in the central parts of W Iceland.

Pressure and winds. The surface maps show a moderate, in S Iceland rather strong, E flow without much curvature. The main features of the 500 mb maps are a low situated S or SW of Iceland and a high NE (in April: E) of Iceland. This indicates a so-called Ω -circulation. On the maps for May and October the high is well-developed, which means that blocking may have been common in association with type 125 during these months. The maps for most of the other months show a rather weak high, probably not exerting a blocking influence for any length of time. The gradient at the 500 mb level is relatively weak. In the region of Iceland the isolines mostly have a weak cyclonic curvature. Pressure tendencies at surface are generally small; with or without blocking, type 125 seems to be characterized by a sort of equilibrium between the polar anticyclone and the North Atlantic low.

The "mean max. wind" velocities are high or very high at Vestmanneyjar (ranging from 27 knots in May and October to 42 in January and February). Rather high values are obtained at some

other stations, mainly in January (Fagurhólsmýri 32, Hveravellir 28, Grímsey 24, Hornbjargsviti 23, Hraun and Raufarhöfn 22 knots). Low values prevail at most stations in the interior and, more noteworthy, at the east coast, where the monthly means range from 11 to 16 knots at Dalatangi and from 10 to 13 knots at Teigarhorn. It may be mentioned that in N Iceland the annual variation of the wind velocity differs considerably between the various stations: at Hornbjargsviti and Raufarhöfn the mean max. wind for May is only half as large as in January, but at Hlaðhamar the values for April and May are somewhat higher than that for January.

Gale frequency is quite high at Vestmannaeyjar, and a few exceptionally severe E gales have occurred at that station on days referred to type 215 (86 knots on 15 March 1958, 87 knots on 29 Dec 1965). The other stations mentioned above as having relatively high mean max. wind values, in particular Fagurhólsmýri, also experienced a number of gales, but in large parts of the country the gale frequency was moderate or low. For Iceland as a whole, a large majority (79%) of the gales were easterly or northeasterly (direction 50-100°).

Temperature. As shown by the figures giving the departures from normal of the 500 mb mean relative topography month by month for type 125 (see Supplement), the lower half of the troposphere is, on an average, slightly warmer than normal, except in May and December when it is relatively cold. The departures from normal temperature at surface are also rather small. They are positive throughout in January, February, March and October, reaching values between +2 and +3°, mainly in parts of S Iceland, during the first three months of the year. During April and May the departures are consistently positive in S Iceland (Hæll: +1.4 and +0.5), negative in the N (Hornbjargsviti -2.0 and -2.5); to some extent this is probably a cloudiness effect. November and December show, also consistently, a certain contrast between coast and inland: in November, some coastal stations have departures exceeding +1° (Fagurhólsmýri and Raufarhöfn +1.9), but at a few inland stations the departures are negative (Síðumúli -0.6);

in December, departures are positive at a few coastal stations (Fagurhólsmýri and Raufarhöfn +0.4, Lambavatn +0.3), negative in the interior (Akureyri -1.8°).

The maps labelled no 5 show small differences between maximum and minimum temperature at most coastal stations; at Dalatangi the range is very small (2.0° in February, slightly more than 3° in April and May). The largest differences are found in the interior, but in some months (April, May and November) not very far from the W coast; the value for Reykjavík is well above that for Akureyri in May and November. Similar contrasts as for type 124, but not quite as large, are found - mainly in May but also in March and April - between Hlaðhamar and Síðumúli, the mean maximum temperatures for May being 4.8 and 10.5° respectively.

Cloudiness. For Iceland as a whole, the monthly averages of cloudiness for type 125 are not far from normal, but there is a marked difference between E Iceland and most stations near the N coast, where the sky is usually cloudy or overcast, and W Iceland, where cloudiness is mostly less than normal. The following mean values (for 8 months taken together) show that the cloud cover associated with the easterly winds of this type is almost intact at Hallormsstaður but, in the typical case, brighter intervals are observed occasionally in the Grímsstaðir - Mývatn area and are frequent in the central part of N Iceland:

Dala- tangi	Hallorms- staður	Gríms- staðir	Reykja- hlíð	Hvera- vellir	Síðu- múli	Reykja- vík
7.5	7.2	6.4	6.3	(6.0)	5.6	5.5 oktas

(As for Hveravellir, the monthly mean values were computed, without adjustment, from an incomplete series, and the figure given above may not be quite comparable to the other mean values.)

As regards the annual variation of the cloudiness (for Iceland as a whole) associated with this type, it may be noted that the values for April, May and October are relatively high, whereas the values for the other five months considered here are close to the climatological normals.

Precipitation.The easterly winds characteristic for type 125 are moist in the lower layers of the troposphere, when they reach the E coast of Iceland, and the moist layer is, no doubt, often quite deep. Precipitation is frequent and often abundant at the very coast, as shown by the figures for Dalatangi (8.9 mm per day, or 233% of normal for the 8-month period); a maximum is probably reached at some distance from the coast, due to the effect of topography, but the station which might conceivably serve to prove the correctness of this assumption, namely Hallormsstaður, seems to be rather too far inland for that purpose: the mean precipitation per day has here already decreased to 3.6 mm, or 163% of normal. The maps no 7 indicate a rather regular and rapid decrease in relative precipitation amounts when approaching the west coast, and in the central part of W Iceland the monthly percentage values are mostly between 5 and 30%, except for May when they are somewhat higher (30-60%). A similar decrease takes place along the north coast between Raufarhöfn (2.4 mm/day) and Hraun (0.8 mm/day), but at Hornbjargsviti, which is exposed to the easterly winds, the amounts are again fairly high (2.8 mm/day); however, if the amount of precipitation is expressed in % of its normal value, the figure for Raufarhöfn (133%) is almost twice as high as that for Hornbjargsviti (72%). On the south coast, the decrease is strong, in mm and in % as well, between Fagurhólsmýri and Kirkjubæjarklaustur, but insignificant between the latter station and Vestmannaeyjar; from there the maps for January, February and May show a further marked decrease of precipitation towards the Reykjanes peninsula, but some of the maps for the other months show a different and less simple picture.

The contrasts between E and W Iceland are equally conspicuous as far as precipitation frequency is concerned. This is illustrated by the following table, showing mean values computed from eight monthly frequencies.

	≥0.1	≥1.0	≥5.0	≥10.0	≥20.0	≥40.0
Dalatangi	84	70	41	28	13	3
Reykjahlíð	42	29	6	1	0.5	0
Síðumúli	25	10	0.4	0	0	0

At Dalatangi and Fagurhólsmýri, large daily amounts of precipitation are not uncommon on days referred to this type (see Supplement). An exceptionally large value, 134 mm, was recorded at Dalatangi on 28 October 1972.

Type 125 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	525	525	527	531	532	533	537	529	523	537	529	523
	+3	+1	+3	+3	-1	+1	+2	+3	0	+2	+3	0

B. Stations where the "mean maximum wind" is relatively high

Vestmannaeyjar	(8)
Fagurhólsmýri	(8)
Hraun	(5)
Grímsey	(5)
Hveravellir	(5)

C. Frequency and direction of gales ("maximum wind" \geq 30 knots). Sum of possible

number of days with a gale:	23 x 218 - 126 = 4888
Actual number of days with a gale:	569 = 11.6%

Distribution as to direction:

D. Severe gales.

A wind velocity \geq 60 knots was reported from Vestmannaeyjar on 15 occasions (E: 13, ESE: 2 cases), in one of these also from Hveravellir (ENE). Extraordinarily high velocities were reported on 15 March 1958 (90° 86 knots) and on 29 Dec. 1965 (90° 87 knots).

	3	16	40
.			243
.			206
1			40
3	2	15	

(125.S)

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Kirkjubæjarkl.(7)	Stykkishólmur(7)
Fagurhólsmýri (6)	Hornbjargsv. (6)
Hæll (6)	

G. Stations whose monthly amounts of precipitation, expressed in % of normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Dalatangi (7)	Síðumúli (8)
Raufarhöfn (7)	Hæll (8)
Hallormsst.(7)	Lambavatn (6)
Akureyri (6)	Stykkish. (5)
	Reykjavík (5)

Dalatangi,	28 Oct.1972	133.8 mm
"	25 May 1967	78.3 "
"	3 Feb.1974	63.8 "
"	30 Apr.1964	59.6 "

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Dalatangi (8)	Lambavatn (7)
Hornbjargsv.(8)	Reykjavík (5)
Raufarhöfn (8)	Síðumúli (5)
Grímsey (7)	Vestmanne.(5)
Hallormsst. (7)	

H. Large daily amounts of precipitation (≥ 40.0 mm).

16 cases were reported: 2 in Jan., 2 in Feb., 3 in April, 1 in May, 6 in Oct. and 1 in Dec. The stations at which these large amounts occurred were: Dalatangi (7), Fagurhólsmýri (5), Grímsey (1), Vestmannaeyjar (1) and Keflavík (1).

Amounts exceeding 50 mm were reported in the following

8 cases:

Dalatangi,	28.Apr.1966	58.3 mm
Fagurhólsm.,	24 Feb.1964	58.0 "
Vestmanna.,	9 Dec.1960	51.6 "
Teigarhorn,	28 Oct.1972	51.5 "

Type 126.

Number of cases month by month: 32,28,23,29,28;29,35,28. This is a type with a fairly large "population"; hence, the mean values and frequencies discussed below are probably fairly representative.

Type 126 is a cyclonic type with a well-developed low, both at the surface and at the 500 mb level, not far from its "climatological" position, although the surface low appears to be found to the S (rather than SW) of Iceland: whereas the circulation at 500 mb is definitely cyclonic, the easterly wind at the surface tends to have an anticyclonic curvature, with wind direction at the N coast being NE in most cases. Gale frequency is rather high, and a few severe gales have occurred on days referred to this type. The mean temperature, as shown on maps no 4, are near normal in January, February, March and October and somewhat below normal during April, May, November and December; the differences thus indicated may not be fully representative. Cloudy or overcast weather prevails in most of Iceland, but bright intervals are relatively common in the SW. The amounts of precipitation are large in NE Iceland but generally small in the western part of the country, in particular in the Faxaflói area and to the east of that.

Pressure and wind. All 500 mb maps show a rather deep low, with its centre to the S, SW or W of Iceland, i e rather close to its normal position. The centre appears to be close to W Iceland in April and just off the SW coast during the last three months of the year. The cyclonic curvature in the region of Iceland is well-marked, but in March there is an indication that it does not extend very far to the E. At the surface, the winds over Iceland are mainly between E and NE, with a streamline convergence which is rather well developed during the first five months of the years but seems to be weaker during the period October to December. The curvature of the flow is more or less anticyclonic at the N coast, but as the analysis over this area leans heavily on the interpolated mean pressure values (for 03 GMT) at Grímsey, some reservation may be justified in this respect. Second to Vestmannaeyjar, the stations along the N coast have the highest values of "mean max. wind"; for the country as a whole, these values are rather above average, which agrees with the rather disturbed weather often associated with type 126. Gale frequency is moderately

high (see Supplement). During all 8 months wind from NE and ENE are preponderant in this respect, too; altogether 48% of all gales were from the relatively narrow sector 50-70°. Among the rather large number of gales, two were particularly widespread, and very high wind velocities were recorded at Vestmannaeyjar on three days, as specified in the Supplement.

Temperature. Generally speaking, the mean temperatures associated with type 126 are close to normal in the coastal areas of E and SE Iceland and somewhat below normal elsewhere. Negative departures dominate more or less completely during April, May, November and December; they reach -3 locally in W Iceland in November but are otherwise, with few exceptions, within the interval 0 to -2. The largest positive departures, +1 - +1 $\frac{1}{2}$ °, are found mainly on the coast of SE Iceland in February and October. The minor differences existing between the various months are probably not representative, but the regional differences mentioned above are relatively persistent and may be considered as real.

The small and mainly negative temperature departures at the earth's surface are concomitant with the departures shown by the relative topography (see Supplement), except in the case of April when the mean temperature of the lower troposphere is as much as 4° below normal while the deficiency at the surface is between 1 and 2°. The figures for April would seem to require a steeper lapse-rate than for most other types, but it can hardly be claimed that the precipitation statistics indicate an increased shower activity during that month.

According to the maps labelled no 5, the difference between the daily temperature extremes is generally 3-4° at most coastal stations and 4-5° in the interior and in the Reykjavík area, but differences as large as 6° or more are found locally in January, March, April and May; the values obtained for Eyrarbakki and Síðumúli in May (8.5 and 8.0° respectively) are conspicuously high, but the Síðumúli value is thought to be fairly representative for the surroundings of that station. For November and December the differences are a little larger at Teigarhorn than at Hallormsstaður; this may be real, considering that the mean cloudiness at the latter station is very high and also that the effect of shifts between N and E winds may, at this time of the year, be relatively large at Teigarhorn.

Cloudiness. In the N half of Iceland, type 126 is characterized by a large amount of clouds, covering on an average 80-95% of the sky; the largest figures are obtained at Hornbjargsviti (7.9 oktas in May and November). Locally, however, topography favours the dissolution of the clouds moving from NE to SW; Lambavatn seems to be a typical example of this, with mean values as low as $5\frac{1}{2}$ - 6 oktas in February, October and December and even as low as 5 oktas in May. (Some of the differences between the various months, as indicated for this station and found in the case of other stations, too, are not claimed to be representative, but the low value for May is not improbable.) In the S half of Iceland, the mean cloudiness as shown by maps no 6 is mostly around 6 oktas, but in the months of February, April, May, October, November and December values around 5 oktas are found somewhere in the area east of Faxaflói or between that area and Vestur-Skaftafellssýsla.

Precipitation. As is the case with most types characterized by E and NE winds, the contrast between NE and W Iceland is great and consistent. During all months there is an area in NE Iceland, usually comprising both coastal and interior regions, which receives more than 200% of the normal amount of precipitation, albeit that in October only one station (Hallormsstaður) may serve as a proof. Values as large as 350-450% are found in February (at the NE coast), March (in the Seyðisfjörður-Lagarfljót area) and May (both at the coast and in some inland areas). The boundary between areas receiving more and areas receiving less than normal is well defined in N Iceland: Akureyri is always on the wet side and Hraun usually (all months except October) on the dry side. Farther S we may assume the boundary to be found E of Hofsjökull, but it becomes less well-defined farther south. In fact, the percentage figures for Vestmannaeyjar are almost as high as those for Teigarhorn during January, February, and April, and even slightly higher during March, November and December. The reason for this somewhat anomalous feature may be that large amounts of precipitation are recorded occasionally at Vestmannaeyjar in connection with a line of convergence along the S coast. Some complications are also found in the northwestern peninsula; Hornbjargsviti has consistently much more precipitation (in absolute and relative measures) than Lambavatn, and in most

months receives about the normal amount - in May even twice that amount, a figure which may seem excessive but obtains some support from the May figure for Þórustaðir (140%). The driest part of the country, at least when comparing with normal values, is always found somewhere in W Iceland (less than 25% at Síðumúli during 5 out of 8 months, and in November at several other stations, too), and its exact position does not seem to fluctuate very much.

As for precipitation frequencies, the general picture conveyed by maps no 8 coincides, more or less, with that obtained from maps no 7. The number of days with at least 1.0 mm of precipitation is larger than 50% at the coastal stations of NE Iceland; the same applies in January, March and October to the SE and S coast as far W as Vestmannaeyjar. In rather marked contrast to all other stations in NW Iceland, Hornbjargsviti also receives at least 1.0 mm on more than 50% of all days; in October (with 80%) it even surpasses all other Icelandic stations in this respect. An area where less than 30% of all days receives 1.0 mm or more is always found in W Iceland; this area is small in October, but otherwise large, and extends into the interior part of NE Iceland in April and May.

Large amounts of precipitation are not infrequent in the easternmost part of the country; in Dalatangi, for example, more than 20% of all days receive 10 mm or more, except in April. Dalatangi is also outstanding as regards particularly large amounts: as much as 40 mm has been recorded there on seven occasions, and from some other station in E or S Iceland on five (see Supplement, item H, for further details).

Type 126 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	521	521	523	520	531	532	522	520				
Departures	-1	-3	-1	-8	-2	-3	-4	-3				

B. Stations where the "mean maximum wind" is relatively high

Vestmannaeyjar (8)	Pórustaðir (8)
Hornbjargsviti (7)	Akureyri (8)
Grímsey (6)	Hallormsst.(7)
Hraun (6)	Reykjahlíð (6)
Hveravellir (5/7)	Grímsstaðir(5)

C. Frequency and direction of gales ("maximum wind" \geq 30 knots). Sum of possible

number of days with a gale:
 $23 \times 232 - 131 = 5205$

Actual number of days with a gale:

$$724 = 13.9\%$$

Distribution as to direction:

31	63	103
4		347
10		130
8		13
1	2	12

D. Severe gales.

A wind velocity \geq 60 knots (from directions between N and ESE) was reported on 12 occasions: 4 in Jan., 2 in Feb., 2 in March, 1 in April, 2 in Nov. and 1 in Dec. The stations from which the reports were received were the following:

Lambavatn (3), Hornbjargsviti (2), Hraun (1), Teigarhorn (1), Vestmannaeyjar (4) and Hæll (1). The relatively large number reported from Lambavatn is noteworthy: this station has a rather low gale frequency, but appears to be more exposed to NE winds than most other stations. A wind velocity \geq 70 knots was recorded at Vestmannaeyjar on three days: 22 and 23 March 1968, and 12 Dec. 1958. In two other cases, 30 Jan. 1966 and 12 Feb. 1974, the gale was particularly widespread.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm		cold
Teigarhorn (6)		Hornbjargsv.(6)
Fagurhólmýri (6)		Stykkish. (6)
Kirkjubæjarkl.(6)		Hveravellir(4/7)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear in comparison with corresponding figures for other stations - as

large		small
Rauíarhöfn (8)		Stykkish. (8)
Hallormsst.(6)		Síðumúli (7)
Dalatangi (6)		Lambavatn (7)
Akureyri (6)		Hæll (7)
Grímsey (5)		Reykjavík (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high		low
Hornbjargsv.(8)		Reykjavík (8)
Greímsey (8)		Vestmanna.(8)
Raufarhöfn (7)		Kirkjub.kl.(7)
Hallormsst. (7)		Keflavík (6)
Þórustaðir (5)		Eyrarbakki (5)
Dalatangi (5)		

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount of precipitation ≥ 40.0 mm was reported in 12 cases (from Dalatangi in seven, Hallormsstaður and Vestmannaeyjar in two each and Fagurhólmýri in one case). In seven cases the amount was ≥ 50 mm:

Dalatangi	2 Feb. 1970	86.3 mm
"	1 " 1974	73.3 "
Hallormsstaður	4 Mar. 1972	63.9 "
Vestmannaeyjar	22 " 1968	62.0
Dalatangi	30 Jan. 1966	58.1 "
"	4 Mar. 1977	54.5 "
Fagurhólmýri	18 Dec. 1962	50.9 "

Type 134.

Number of cases month by month: 22,11,21,19,22;20,26,26. As the mean values and frequencies obtained for February are based on a small number of cases, some of them are probably not representative. For all other months it may be assumed that the representativeness is reasonably good.

Type 134 is characterized by the advection of mild - often very mild - air from SE across Iceland. Gales are rather frequent on the S coast but at the N coast winds are usually much lighter. The largest departures of the surface temperature are found in the interior and amount to 5 or 6° during most of the months concerned; the smallest departures, mostly 2-3°, are generally found near the E coast. Mean daily maximum temperatures in May exceed 15° locally in the interior of NE Iceland. Except for a few exposed stations, night frosts are rather uncommon even during winter when type 134 prevails. The weather is usually cloudy or overcast in the southern half of the country but generally much brighter in the northern half, above all in the interior of NE Iceland. A similar contrast is found with respect to the amount and frequency of precipitation.

Pressure and winds. The 500 mb maps are very similar from month to month. They all show a well-developed ridge to the E of Iceland; the flow is anticyclonic over the Icelandic region, with an easterly component in the southern part of the area covered by the analysis and a rather small westerly component in the vicinity of Jan Mayen.

The maps showing the pressure distribution at sea level are also similar in their broad features, but the analysis of these maps presented some problems. Difficulties were found not only - as with most other types - in SW Iceland (where they might have been eliminated, more or less, by introducing standard corrections:appr. -0.5 mb to the mean values for Eyrarbakki and about +0.5 mb to the values for Vestmannaeyjar), but also in E and N Iceland. The available data clearly indicate the existence

of a trough over central or N Iceland: although the general geostrophic flow is from the SE, the mean pressure on most of the monthly maps is about as high at Kirkjubæjarklaustur as in Akureyri. On individual days, the pressure distribution will presumably be less simple, but some of the details will depend on the exact direction and velocity of the basic flow, and possibly on its thermal structure, and may thus cancel out when averages are formed. On the other hand, the simple solutions shown e g on the monthly maps for January or October do not agree very well with the complicated topography of Iceland, and the evidence from a denser network might have suggested the existence, even on the mean maps, of individual mini-troughs in the rear of such mountains as Mýrdalsjökull, Langjökull and Hofsjökull. Obviously, it would have been beyond the scope of the present study to achieve a detailed analysis of the pressure distribution type by type and month by month.

The map for February requires a special comment. It is quite plausible that small-scale vortices may develop on the lee side of the mountains, but it is less plausible that they should recur at more or less fixed positions often enough to show up on the mean maps. The simplest explanation why the existence of two such vortices is indicated by the February data is that the number of cases - only 11 - is too small for an efficient elimination of such spurious detail.

Type 134 is often accompanied by strong SE winds in SW Iceland; the "mean max. winds" for Vestmannaeyjar are about 40 knots (May 34, January and October 48), and the corresponding values for Reykjavík and Keflavík are as high as 24-25 knots in January, March and October. On the N coast of Iceland the values are much lower; the low values for Hornbjargsviti (after some minor corrections required because of incomplete data: January 7, March 8, May 4 knots) are quite remarkable.

For the country as a whole the gale frequency (as defined), 11.3%, is a little above average, but here, too, there is a large difference between S and N Iceland. A large majority of the gales were from the SE quadrant (as many as 86% from the sector 80°-190°). As specified in the Supplement, very large

velocities, about 70 knots, were recorded (from due E) at Vestmannaeyjar on two occasions.

Temperature. Type 134 is characterized by mild weather everywhere in Iceland. The departures for the 500 mb relative topography (see Supplement) are consistently 5-6°, in October and November even higher (7°). The departures from normal temperature at the surface are mainly within the range +3 - +6°, except in May when they are somewhat smaller at most places; very large departures, +6 - +7°, occur in January and October in an area extending from Faxaflói to the interior of E Iceland. On most other maps, too, the largest departures are found within that area, but certain parts of the NW peninsula, represented by Þórustaðir and Lambavatn, are also conspicuously mild. The smallest departures are generally found on the SE coast where the influence of the water temperature is clearly seen; at Dalatangi they vary between +1.1 (May) and +3.4 (March), at Vestmannaeyjar between +1.7 (May) and +4.4 (January). The departures at Hornbjargsviti are consistently 2-3° less than at Þórustaðir during winter and spring.

Three factors, at least, combine to keep the diurnal variation of temperature near the coast of E and S Iceland within a much narrower range than at most inland stations: the rather strong onshore wind, the highly conservative water temperature and the large amount of clouds (as described in the following section). The contrast may be exemplified by the following table (K: Kirkjubæjarklaustur, A: Akureyri)

	J	F	M	A	M	O	N	D
$\overline{t_x}$, K	5.5	5.4	6.7	7.7	11.2	10.2	7.1	6.1
$\overline{t_x}$, A	5.8	5.4	8.5	11.2	16.3	12.4	7.6	7.0
$\overline{t_x}$, K-A	-0.3	0.0	-1.8	-3.5	-5.1	-2.2	-0.5	-0.9
$\overline{t_n}$, K	2.9	1.9	3.8	4.6	7.0	8.0	3.9	2.7
$\overline{t_n}$, A	0.1	-1.3	1.3	2.8	5.9	4.7	1.9	1.1
$\overline{t_n}$, K-A	+2.8	+3.2	+2.5	+1.8	+1.1	+3.3	+2.0	+1.6
$\overline{t_x - t_n}$, K	2.6	3.5	2.8	3.1	4.2	2.2	3.2	3.4
$\overline{t_x - t_n}$, A	5.7	6.8	7.2	8.4	10.5	7.6	5.6	5.9
%	46	51	39	37	40	29	57	58

The last line gives the difference $\overline{t_x - t_n}$ at Kirkjubæjarklaustur expressed as a percentage of the corresponding difference at Akureyri. The contrast between October and November indicates that the figures for these two months are not fully representative.

As analysed, all monthly maps show an area where the mean difference $\overline{t_x - t_n}$ is larger than 6° , but in the case of November, December and January the supporting evidence is weak. Differences as large as 10° are found in May at Akureyri (see above) and Hallormsstaður. The smallest differences are always found at Vestmannaeyjar where they range between 1.4° (October) and 2.8° (February).

The $\overline{t_x}$ -values for May in the interior of NE Iceland are among the highest found for any type; the value for Reykjahlíð, 15.0° , is 1.4° higher than the second highest value. In Akureyri a maximum temperature exceeding 15° was observed on 68% of the days of May referred to type 214. As for minimum temperatures, the mean values indicate that frosts are uncommon with this type at low altitudes in the S of Iceland throughout the year and not even frequent in N Iceland, except at some exposed stations or at greater altitudes.

Cloudiness. As far as the lower troposphere is concerned, the air mass reaching the coast of SE and S Iceland when type 134 prevails is always moist, and as the sky is most often overcast, the mean cloudiness figures for stations such as Kirkjubæjarklaustur and Eyrarbakki are of the order of 7 oktas or more. The cloud cover partly breaks up as the air flows across SW Iceland but is largely reorganized when it continues across Faxaflói and Breiðafjörður: the mean cloudiness at Lambavatn is almost as high as for stations previously mentioned. The higher mountains of SE Iceland warrant a more efficient scattering of the clouds, and in NE Iceland bright weather is not uncommon in connection with this type. The mean conditions for three different areas are shown by the following tables:

Mean cloudiness (oktas), type 134

	J	F	M	A	M	O	N	D
A(S Iceland)	7.0	7.0	7.5	7.3	6.4	7.7	6.9	7.2
B(NW Iceland)	6.0	6.6	6.8	6.9	6.6	7.3	6.8	7.1
C(NE Iceland)	5.1	5.1	4.8	5.0	4.8	5.8	5.8	5.6

The stations selected for the computation of representative mean values were: for A, Teigarhorn, Kirkjubæjarklaustur, Vestmannaeyjar and Eyrarbakki; for B, Síðumúli, Stykkishólmur, Lambavatn and Hornbjargsviti; for C, Akureyri, Reykjahlíð, Grímsstaðir and Raufarhöfn. It may be noted that the mean values for Hraun and even some of the values for Hlaðhamar show a closer resemblance to those given for area C than to those for B, possibly an effect of the Langjökull-Hofsjökull mountains.

Precipitation. Along the south coast, type 134 is - as might be expected - accompanied by abundant precipitation, at low altitudes almost entirely in the form of rain. The percentage figures, which are mostly within the range 150-200% (in January, April and May rather lower, in November somewhat higher), may seem relatively modest, but it should be remembered that this is an area where the normal precipitation is generally large; the absolute amounts are mostly between 5 and 10 mm per day referred to this type, but as large as 10-15 mm in October, November and December at two or more of the southernmost stations. Rather high percentage figures (150-200%) are also obtained during some months at Lambavatn (April and December) or Þóru- staðir (November), but all other parts of N Iceland and most interior regions have mainly dry weather, with percentage figures below 25 over large areas in January, March and April, October and December. On five of the eight maps Síðumúli has a lower percentage value than any of its neighbours, possibly because of local topographical factors. Hallormsstaður and Dalatangi seem to belong to the dry area during May (11 and 26% respectively) and October (15 and 24%) but otherwise hold an intermediate position with 60-150% of the normal amounts.

The contrast with respect to precipitation frequencies between the wettest and the driest part of Iceland ^{illustrated by} may be the following table:

Number of days (%) with a precipitation ≥ 5.0 mm, type 134:

	J	F	M	A	M	O	N	D
A(S Iceland)	34	46	33	20	23	52	46	59 %
C(NE Iceland)	0	2	0	0	0	1	0	0 %

As for the stations selected for the computation of the mean values,

Type 134 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	O	N	D
Rel. top.	533	534	538	538	543	543	543	549	540	537
Departure	+11	+10	+11	+10	+10	+10	+10	+14	+14	+14

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar(8)	Þórustaðir(8)
Keflavík (8)	Hlaðhamar (7)
Reykjavík (8)	Teigarhorn(7)
Fagurhólsmýri (7)	Hraun (7)
Hveravellir (5/7)	

C. Frequency and direction of gales ("maximum wind" ≥ 30 knots). Sum of possible number of days:

$$23 \times 167 - 88 = 3753$$

Actual number of days with a gale:

$$424 = 11.3\%$$

Distribution as to direction:

35
87
103
9 50 126

D. Severe gales.

A wind velocity ≥ 60 knots from E or ESE was reported from Vestmannaeyjar on 15 occasions (Jan. 4, Feb. 1, March 3, April 2, October 2 and Dec. 3). A southerly gale ≥ 60 knots was reported in March from Hveravellir and in November from Hornbjargsviti. The highest velocities were observed at Vestmannaeyjar: 90° 72 knots on 3 Feb. 1966, and 90° 70 knots on 19 Oct. 1968.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

	warm		cold	
Síðumúli	(8)	Dalatangi	(8)	
Þórustaðir	(7)	Teigarhorn	(8)	
Reykjahlíð	(6)	Vestmannaeyjar	(6)	
Hveravellir	(5/7)	Hraun	(6)	
Lambavatn	(5)	Hornbjargsv.	(5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

	high		low	
Kirkjubæjarkl.	(8)	Reykjahli.	(8)	
Eyrarbakki	(8)	Hraun	(7)	
Keflavík	(8)	Grímsst.	(7)	
Vestmannaeyjar	(6)	Raufarh.	(6)	
Lambavatn	(5)	Akureyri	(6)	

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

	large		small	
Vestmannaeyjar	(8)	Reykjahlíð	(7)	
kirkjubæjarkl.	(6)	Grímsstaðir	(7)	
keflavík	(5)	Akureyri	(6)	
Fagurhólsmýri	(5)	Grímsey	(6)	
Teigarhorn	(5)			

H. Large daily amounts of precipitation (≥ 40 mm).

A daily amount of precipitation ≥ 40.0 mm was reported in 18 cases (among them 7 in November and 4 in December). The stations at which these large amounts were measured were: Fagurhólsmýri (5 cases), Teigarhorn (4), Kirkjubæjarklaustur (3), Vestmannaeyjar (2), Keflavík (2), Stykkishólmur (1) and Dalatangi (1). Amounts ≥ 60.0 mm were reported on three occasions:

Fagurhólsmýri	5 Nov. 1974	76.2 mm
Dalatangi	23 Apr. 1971	70.9 "
Kirkjubæjarkl.	5 Nov. 1974	62.0 "

Type 135.

Number of cases month by month: 24,20,32,28,35;21,19,26.
The mean values and frequencies discussed below may be considered representative as far as March, April and May are concerned, and fairly representative in all other cases.

At the 500 mb level type 135 is characterized by a moderately strong SSE current. The surface winds are mostly between E and SE, and often strong along the coast of SW Iceland. Mean temperature are well above normal in most of Iceland and may still be rising, as warm-air advection is taking place. The weather is generally cloudy or overcast, and large amounts of precipitation, at low altitudes mainly in the form of rain even in winter, are usually reported from the SE and S parts, sometimes also from the SW parts of Iceland. In most of N Iceland 135 is a rather dry type, but only in a few more or less sheltered positions is it definitely dry during most of the eight months concerned.

Pressure and winds: The 500 mb maps all show a well-developed ridge of high pressure to the E of Iceland, extending far N over the Norwegian Sea, and a cyclone, often rather deep, to the SW. On an average, the SSE flow across Iceland is moderately strong in the middle of the troposphere. It is usually rather straight, as the average position of the limit between cyclonic and anti-cyclonic streamline curvature is found in the vicinity of Iceland. The current is mild, with departures from the monthly normal temperatures in the lower half of the troposphere being as high as +4° in winter (December to March) and 2-3° during April-May and October-November.

At the earth's surface, the winds over the Icelandic region are mostly between E and SE. The gradient is, as with most E weather types, much stronger in the area of SW Iceland than in the NE part of the country. A tendency towards the formation of a trough over N Iceland is discernible on nearly all maps and clearly seen on some (in particular on the maps for March and November).

The wind statistics confirms the general picture obtained from the surface maps: the "mean max. wind" values are rather high along the S coast, rather low at most stations in the interior and in the NW peninsula, whereas the coastal areas of NE Iceland take an intermediate position. The overall mean frequency of gales (as defined) is 12.1% or slightly above average, but the

excess ~~goes back~~ almost exclusively ~~to~~ the large number of gales reported from Vestmannaeyjar and a few other coastal stations in S and SW Iceland. 77% of all gales were from the SE quadrant or, strictly speaking, from the sector between 75 and 195°. In this respect, however, there is a marked difference between the various months. February and March together have as many as 55% of the gales from S and SSE and only 30% from E or ESE, whereas May has 77% from E and ESE and only 6% from S and SSE. April and November to January show a more uniform distribution within the SE quadrant, while the number of gales in October was too small to add any significant feature to the picture obtained. It seems rather unlikely that the major difference quoted above (mainly SSE gales in February and March, mainly ESE in May) should be a matter of chance; it may reflect the declining cyclonic activity in the area of S Greenland in the course of the spring.

Some of the gales which occurred at Vestmannaeyjar on days referred to type 135 were very strong; thus, a velocity of 88 knots (from E) was registered on 29 Nov. 1960. For further details see Supplement, section D. The most widespread gales, as far as type 135 is concerned, occurred on 20 Feb. 1976.

Temperature. As type 135 is associated with an inflow of mild maritime air from the sea SE of Iceland, often combined with an advection of still warmer air in the lower troposphere, it regularly leads to positive temperature departures all over the country. The departures are mostly between 3 and 5° in January, February and March, and then decrease gradually, being around 2° in May when the day temperatures, owing to the prevalence of cloudy weather, are less high than with other mild weather types. In October, November and December departures are mostly in the interval +2 to +3 $\frac{1}{2}$ °.

The geographical distribution of the temperature departures, as shown on maps no 4, is characterized by a high degree of continuity from month to month. Thus, the departures are large in the interior of NE Iceland - mainly because of the intermittent occurrence of foehn winds, but in April and May also because the weather in this area is less cloudy than in most other parts of the country; they are small at the coastal stations of SW Iceland and besides, most of the year, at some relatively maritime stations in the NW (Stykkishólmur, Hornbjargsviti). The average departure

for the 8 months is $+4.2^{\circ}$ in Reykjahlíð, but only $+2.2^{\circ}$ in Vestmannaeyjar and Hornbjargsviti.

Just like the maps no 4, maps no 5 show good continuity from month to month. An area of relatively large mean differences, generally $6-7^{\circ}$, between maximum and minimum temperatures is found in the interior of Iceland; the largest values (among the stations used for the analysis) are usually found either in Akureyri or at Hlaðhamar, i.e. near the bottom of a fjord where the foehn influence is more important than in the uplands between and S of the fjords. Low values of the mean max.-min. difference is, as with nearly all types, found at some of the most exposed coastal stations; at Vestmannaeyjar the largest difference is 3.6° in January and February (possibly because frontal passages are then rather frequent with this type), the smallest 2.1° in October.

Cloudiness. Type 135 is, for Iceland as a whole, more cloudy than almost any other type, but some areas in the interior of N Iceland have relatively frequent intervals with broken clouds, partly under the influence of foehn winds. Very high figures for the mean cloudiness, about 7 oktas, are found at several stations at the E coast and in S and W Iceland; the 8-months mean is $6.9-7.0$ oktas at the following stations: Dalatangi, Teigarhorn, Kirkjubæjarklaustur, Eyrarbakki, Síðumúli, Lambavatn and Hornbjargsviti. At the other extreme, the corresponding mean value is 5.7 at Grímsstaðir, 5.8 at Hlaðhamar and 5.9 at Reykjahlíð. The systematic differences from month to month are remarkably small; a few local exceptions may be found in studying maps no 6 but might be based on values which are not fully representative.

Precipitation. Large amounts of precipitations are associated with type 135 in the coastal strip of SE and S Iceland and, equally pronounced, in the interior of E Iceland as represented by Hallormsstaður. The Faxaflói-Breiðafjörður area shows, as might have been expected, a general decrease of the precipitation from S to N but also an annual variation, the values for February and March being relatively large. In the interior of N Iceland, and at the coast from Patreksfjörður to Langanes, most or all

months receive less than ^{the} normal amounts. It seems, however, that the type is very dry in a few more or less sheltered locations only. The 8-month sum for Þórustaðir is 55%, and Hraun 48%, of the corresponding normal value. This may be compared with the high figures obtained for some stations in E and S Iceland: Hallormsstaður 367, Fagurhólsmýri 300, Vestmannaeyjar 244%.

Apart from the area in W Iceland already mentioned, the variations from month to month in the amount of precipitation (expressed in % of the normal amount) are mostly rather small and in many cases probably not representative. It may be remarked, however, that the area of abundant precipitation extends farther N along the E coast in December-January than in February to May, as shown by the following figures for Raufarhöfn: Dec. 133, Jan. 156, Feb. 18, March, April and May 43 to 67% of normal precipitation. In the Akureyri-Grímsstaðir area, the values for January, June and November are relatively high (mostly 85-150%), whereas those for March, April and October are low (mostly 25-45%); the difference is probably too large to be entirely fictitious, but is likely to be reduced if the series of observations is lengthened.

The precipitation frequencies show in a convincing manner the regime characteristic of this type in large parts of SE and S Iceland: in the coastal area, almost no day is entirely free of precipitation, appr. 50% of all days receive 10 mm or more, and large, even very large amounts are by no means infrequent; in the interior, where some sheltering may be assumed, some 20-30% of the days are rainless during spring and autumn, but even here moderately large amounts are common, and very large amounts have occurred in a few cases.

Number of days (%) with an amount of precipitation exceeding certain limits as indicated.

Fagurhólsmýri	J	F	M	A	M	O	N	Dec. to	5 other	
								Feb.	months	
≥ 0.1 mm	100	100	97	96	94	90	89	96	99	94
≥ 1.0	96	95	94	89	90	90	89	96	96	91
≥ 5.0	88	75	66	71	60	86	79	77	80	70
≥ 10.0	63	60	44	61	37	67	47	69	64	44
≥ 20.0	33	10	12	21	20	48	21	42	30	24
≥ 40.0	4	5	6	4	6	19	15	12	7	8

Hallormsstaður	J	F	M	A	M	O	N	D	Dec.to Feb.	5 other months
≥ 0.1 mm	96	95	72	79	66	67	84	100	97	73
≥ 1.0	92	80	56	61	51	57	74	85	86	44
≥ 5.0	71	55	22	25	14	33	53	73	67	27
≥ 10.0	38	40	9	14	0	19	32	50	43	13
≥ 20.0	29	15	3	7	0	0	16	31	26	4
≥ 40.0	8	0	0	0	0	0	11	8	9	0

Beyond showing the generally large frequency of large daily amounts, the table illustrates a difference between coast and inland as far as the annual variation is concerned: in winter, Hallormsstaður has almost the same frequency of moderate and large amounts as Fagurhólsmýri, but in spring and autumn the frequencies are much more at variance.

As for the occurrence of very large daily amounts (≥ 40.0 mm), reference is made to table H in the Supplement.

Type 135 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. topl	531	531	533	533	537		540	532	531
Departure	+9	+7	+9	+5	+4		+5	+6	+8

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar(8)	Þórustaðir (8)
Fagurhólsmýri (8)	Teigarhorn (6)
Reykjavík (7)	Akureyri (6)
Keflavík (6)	Lambavatn (5)
Dalatangi (5)	Hallormsst.(5)

D. Severe gales.

A wind velocity ≥ 60 knots was reported from Vestmannaeyjar on 13 occasions (Jan. 2, Feb. 3, March, April and May 1 each, Nov. 3 and Dec. 2). The wind direction was E or ESE in 10 cases and SSE or S in 3.

Velocities ≥ 70 knots were measured five times:

26 Jan. 1961 (90° 74 knots),
 28 Feb. 1971 (110° 70), 29
 Nov. 1960 (90° 88), 15 Dec.
 1966 (90° 78) and 19 Dec.
 1969 (110° 75 knots). No
 other station reported a v
 velocity ≥ 60 knots.

C. Frequency and direction of gales ("maximum wind" ≥ 30 knots).

Sum of possible number of days with a gale:

$$23 \times 205 - 126 = 4589$$

Actual number of days with a gale:

$$556 = 12.1\%$$

Distribution as to direction:

	1	3	4
4			664
11			129
23			106
	18	68	125

For type 135 this distribution has varied considerably from month to month, as described in the main text.

- E. Stations which, according to the anomalies of monthly mean temperature, appear as
- | warm | cold | |
|----------------|-----------------|--|
| Reykjahlíð (8) | Vestmannaē. (8) | |
| Grímsstaðir(7) | Hornbjargsv.(6) | |
| | Keflavík (5) | |
| | Stykkish. (5) | |
- F. Stations whose monthly means of cloudiness, compared with those of other stations, are
- | high | low | |
|----------------|-----------------|--|
| Eyrarbakki (6) | Grímsstaðir (8) | |
| Síðumúli (6) | Hraun (8) | |
| Dalatangi (5) | Reykjahlíð (7) | |
| | Akureyri (5) | |
- G. Stations whose monthly amounts of precipitations, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as
- | large | small | |
|-------------------|-----------------|--|
| Hallormsstaður(8) | Hraun (6) | |
| Fagurhólsmýri (8) | Grímsstaðir (5) | |
| Teigarhorn (7) | Grímsey (5) | |
| Kirkjubæjarkl.(5) | Þórustaðir (5) | |
| Vestmannaeyjar(5) | Akureyri (5) | |
| | Hornbjargsv.(5) | |
- H. Large daily amounts of precipitation (≥ 40.0 mm).
A daily amount of precipitation ≥ 40 mm was measured on no less than 45 occasions. The number of days on which such amounts were reported from one or more stations were: Jan. 4, Feb. 2, March 4, April 5, May, Oct. and Nov. 4 each, Dec. 6. The stations involved were: Fagurhólsmýri (15 times), Teigarhorn (7), Hallormsstaður (6), Vestmannaeyjar (6), Kirkjubæjarklaustur (5), Dalatangi (4), Hæll and Eyrarbakki (1 each). An amount ≥ 60.0 mm was reported twice in Jan., once in May, twice in Oct., three times in Nov. (5 Nov. 1968: Hallormsstaður 80.1 mm, 13 Nov. 1968: Dalatangi 87.4 and Teigarhorn 80.2 mm) and once in December.

Type 136.

Number of cases month by month: 35,9,24,22,18;28,13,18. Because of the large variations shown by these figures, the representativeness must be assumed to vary considerably, from very good in January to poor in November and very poor in February. The low frequency for February reflects a peculiar feature of that month during the 20-year period under review: the correlation between the W and S component of the 500 mb flow was much higher during February than during the other 7 months. Type 136, which is characterized by a weak W and a strong S component, thus represents a combination which proved relatively unusual in February during the period concerned.

Type 136 is characterized by the existence of a deep, high-reaching cyclone off SW Iceland. As this cyclone is usually occluded, pressure tendencies are mainly positive, in W Iceland at least, and although the temperature is generally above normal, the departures are small to moderate; during the autumn, in particular, small negative departures may be found in W Iceland. The gale frequency is rather high, and it is noteworthy that the various wind directions, except those from the NW quadrant, are rather equally represented; this fact may have arisen from a certain scattering with respect to the exact position of the surface low at 00 GMT, or - perhaps just as likely - from the rapid and sometimes freak development of secondary lows which may take place on days with this type of circulation. The clouds which accompany the occluded cyclone are partly of a convective type and may give frequent, sometimes rather heavy showers. Where a forced uplift is caused by topographical features, as is usually the case in S and E Iceland and more occasionally in other parts of the country, large amounts of precipitation may result. Thus, type 136 is generally a wet type, and it is very wet indeed in the easternmost and southeasternmost parts of the country.

Pressure and winds. At the 500 mb level a deep cyclone is situated off SW Iceland, at some distance from the coast on most monthly maps but fairly close at some, e.g. on the map for December. The area of cyclonic curvature usually extends beyond Iceland towards E and N; the ridge which may be considered a counterpart of the cyclone may be found over the eastern part of the Norwegian sea or still farther east. The configuration of the surface isobars, and hence the low-level winds, varies

considerably, even on the monthly maps; for instance, a well-marked surface trough, probably caused by the topography of Iceland, is seen to extend from W to E (or from SW to NE) across the N part of the country on most of these maps but is hardly discernible in January and November. With the exception of March (when the trough over N Iceland is particularly marked) the general direction of the surface flow over the country is between E and SE, which may be compared with the SE or SSE winds at the 500 mb level; the resulting cold-air advection has not yet led to negative temperatures in the lower half of the troposphere, except in April when the surface temperature of the sea south of Iceland is comparatively low. The pressure tendencies are generally positive in W Iceland but partly negative in the east, which may indicate the occasional development of a secondary depression moving N between Iceland and the Faroes.

Maps no 3, showing "mean max. winds", confirm the unsettled and often disturbed character of type 136: the velocities shown on the maps are moderately high at the S coast, and at exposed places in other areas, too. Gale frequency is also moderately high (13.4% as defined, see Supplement), and it is characteristic for this type that the various wind directions, except those from the NW quadrant, are rather evenly represented (NE quadrant: 34%, SE quadrant: 30%, SW quadrant: 26%). This may seem almost incompatible with the maps showing the distribution of monthly mean pressure at the surface, but there are two possible explanations: the exact position of the surface low may vary considerably from case to case, and in the course of 24 (strictly speaking: 21) hours important developments may, as indicated above, take place in the region concerned. Those of the gales which were severe (see Supplement) were, however, more often easterly than from other directions. There were two instances of widespread gales on days referred to type 136: on 3 and 21 March 1976 - in both cases with mainly S and SW wind, indicating a displacement northwards of the deep cyclone itself to a position NW of Iceland.

Temperature. The air which - by this type - flows across Iceland from an easterly or southeasterly direction has had a long trajectory over the ocean, but may often - as the main cyclone is occluded or in the process of occluding - originate from the source region of the polar air which is drawn into the vortex from Labrador or SE Canada. The temperature departures of the lower troposphere are generally positive (except in April, as mentioned above), but rather small, and the same applies to the departures of the temperature at station level, shown on maps no 4.

More specifically, these departures are mostly within the range $+1 - +2\frac{1}{2}$ in January, February and March, and between 0 and $1\frac{1}{2}$ in April, May, October and December; in November (with rather few cases) they are generally between $-\frac{1}{2}$ and $+\frac{1}{2}$. The largest positive departures are found in E Iceland, both at the coast and in the interior; they are as large as $3 - 3\frac{1}{2}$ in January and March. Negative departures are mainly confined to the W half of the country and do not exceed 1° . The departures at Hornbjargsviti are partly as much as 1 or even 2° lower than those of neighbouring stations (see maps for January, February and December), probably because Hornbjargsviti in a few cases was reached by the main frontal system of the cyclone several hours later than any other station used for the present analysis. The comparatively low temperatures in SW Iceland might be explained by the relative shortness of the oceanic trajectory of the air particles arriving here.

Maps no 5 show, very consistently, somewhat higher values for the average difference between maximum and minimum temperatures at stations in the interior than those experienced at most coastal stations. Differences as large as 7° are found locally in May and, rather unexpectedly, in December, whereas a few highly exposed coastal stations have differences less than 3° in February (Grímsey), October (Vestmannaeyjar) or November (Dalatangi, Stykkishólmur). One might perhaps have expected lower values as those observed at most coastal stations, but it should be remembered that type 136 is a disturbed type where wind shifts and perhaps frontal passages are to be expected.

Cloudiness. As far as cloudiness is concerned, type 136 is characterized by moderately large mean values, mainly in the range $5\frac{1}{2}$ - 7 oktas, with rather unimportant local variations. For the country as a whole, the values are rather high in February, rather low in April; for the 8 months as a whole, they are high in NW Iceland, rather low in the interior of NE Iceland. In the latter case the differences, though rather small, are probably real; in the former case their significance is questionable.

Precipitation. Two striking features characterize the maps (no7) showing the amount of precipitation expressed as a percentage of the normal amounts: the occurrence of very large, in some cases exceptional, amounts over an extended area in E and SE Iceland, and the small extent or even (in May) the complete absence of areas receiving less than normal precipitation. Expressed in mm per day, the excess is largest (10.5 mm) at Fagurhólsmýri; expressed in % of the normal amount, it is even larger, almost 500%, at Hallormsstaður (some 40 or 50 km from the coast), as seen from the following table.

	Mean daily amount of precipitation (type 136), mm									mean for 8 months *
	J	F	M	A	M	O	N	D		
Dalatangi	11.4	12.8	13.7	4.8	12.9	15.1	10.6	8.3	11.2	(3.8)
Teigarhorn	11.8	11.5	11.3	6.2	13.2	11.9	9.9	10.5	10.8	(3.7)
Fagurhólsmýri	13.6	20.2	12.3	11.1	20.0	18.3	14.9	13.4	15.5	(5.0)
Hallormsst.	12.9	15.2	15.7	3.4	6.7	9.2	7.4	13.5	10.5	(2.2)

	Same as above, but expressed in % of the normal amounts									8-month average
	J	F	M	A	M	O	N	D		
Dalatangi	285	427	472	145	478	328	212	163	293	
Teigarhorn	262	338	365	230	550	259	236	228	293	
Fagurhólsmýri	252	470	251	278	541	305	253	220	307	
Hallormsst.	339	661	1047	309	744	460	264	409	475	

The 8-month averages given in the lower part of the table were obtained from means and normal means for the eight months, before the rounding-off which led to the values given in the upper part of the table.

*) The corresponding "normal" (sum of eight monthly averages of daily amount of precipitation) is given in parenthesis.

From the area of maximum excess the precipitation decreases rapidly towards the interior of NE Iceland, where Grímsstaðir receives only about 130% of the normal amount (varying between wide limits: 217% in March and only 29% in April), and rather less rapidly along the NE coast: at Raufarhöfn the corresponding figures are 187%, 300% (February) and 113% (December). Moving west along the S coast, it decreases rather slowly and not quite regularly as seen by the figures for Vestmannaeyjar (213%, 286% (March), 154% (December)) and Keflavík (169%, 321% (March), 122% (October)).

In the central and northwestern parts of Iceland most months receive between 75 and 175% of the normal amount of precipitation on days referred to type 136, but there are some exceptions: a considerable portion of northern Iceland receives more than 200% in May, as do some coastal stations in other months, mainly October, whereas minor areas of a relatively large deficiency, about 50%, are found in January to April and in November.

Maps no 8 confirm the impression conveyed by maps no 7: type 136 is extremely wet in a rather broad strip along the coast of E and S Iceland and, broadly speaking, moderately wet elsewhere. The following figures give the relative frequency of an amount ≥ 10.0 mm month by month for a few selected stations:

	J	F	M	A	M	O	N	D
Fagurhólsmýri	63	78	54	50	72	71	46	61
Hallormsstaður	54	56	58	9	17	29	31	56
Vestmannaeyjar	34	33	42	9	17	29	38	33
Reykjavík	17	11	29	5	6	4	23	22
Akureyri	3	0	0	0	0	11	0	0

Type 136 (Supplement).

- A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	O	N	D
Rel. top.	527	528	527	526	533			535	529	524
Departure	+5	+4	+3	-2	0			0	+3	+1

- B. Stations where the "mean maximum wind" is relatively high low
- Vestmannaeyjar(8) Þórustaðir(8)
 Hveravellir (7/7) Teigarhorn(7)
 Dalatangi (5) Hæll (6)
 Reykjahlíð(5)
- C. Frequency and direction of gales ("maximum wind" \geq 30 knots). Sum of possible number of days with a gale:
 23 x 167 = 88 = 3753
 Actual number of days with a gale:

$$503 = 13.4\%$$

Distribution as to direction:

	13	28	27
15	□	99	
18		58	
70		38	
	34	39	64

- D. Severe gales.

A wind velocity \geq 60 knots was reported from Vestmannaeyjar on 11 occasions, from Hornbjargsviti on two, from Grímsey and from Hæll on one occasion. The directions were mainly E or ESE (7 cases), but several other directions (S, SW, WNW and NW, NNE) were represented. 7 out of 15 severe gales were reported on various March days, but the highest velocity was recorded on 8 December 1966 (Vestmannaeyjar, 290° 70 knots).

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Raufarhöfn (7)	Keflavík (7)
Grímsstaðir(7)	Vestmanna. (6)
Hallormsst.(6)	Hornbjargsv.(6)
Teigarhorn (5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Hornbjargsv.(6)	Grímsst. (7)
Lambavatn (5)	Reykjahlíð(5)
Síðumúli (5)	Teigarhorn(5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Hallormsst.(8)	Hraun (5)
Teigarhorn (8)	Síðumúli (5)
Fagurhólsm.(7)	Stykkish.(5)
Dalatangi (5)	

H. Large daily amounts of precipitation (≥ 40 mm).
An amount of 40.0 mm or more was reported in 26 cases (among them 6 in May and 6 in October). Nearly all reports were from stations in SE Iceland: Fagurhólsmýri 9, Hallormsstaður 6, Teigarhorn 3, Dalatangi, Kirkjubæjarklaustur and Vestmannaeyjar 2 each; in addition, there were two reports from Hornbjargsviti. An amount ≥ 50 mm was measured in 6 cases, including two above 60: 67.1 mm in Dalatangi on 15 May 1976, and 67.0 in Fagurhólsmýri on 7 Oct. 1969.

Type 214.

Number of cases month by month: 24,29,32,25,23;28,21,28.
As these numbers are rather large, the mean values and frequencies discussed below may be considered as fairly representative.

Type 214 is characterized by a cold anticyclone moving across Iceland, usually in a SE direction as it is steered by NW winds in the upper troposphere. Gale frequency is very low. During the period October to March, this is essentially a cold type with large negative departures in the interior of E Iceland, particularly in January. In April and May, however, day temperatures are fairly high and the 24-hour anomalies mostly positive, above all in April in SW Iceland. Clouds at various levels are often carried across Iceland by the NW upper winds, but the anticyclonic flow in the lower troposphere is associated with subsidence over large areas, leading to a dissolution of low and perhaps middle clouds, above all in the interior and E parts of Iceland; the mean cloudiness at Reykjavík is between 4 and 5 oktas, to be compared with 6 oktas at Hornbjargsviti and Grímsey. Accordingly, 214 is a dry or very dry type in all parts of Iceland.

Pressure and winds. At the 500 mb level, a blocking anticyclone is situated over the sea SW of Iceland. The surface maps (no 2) show, however, a high centred over Iceland itself, usually over the NW part of the interior. This is essentially a cold anticyclone, during the winter months at least; it is moving SE, steered by the overlying NW current. The barometric tendencies confirm this movement; in particular, fairly large negative tendencies in November and December indicate a rather rapid displacement of the high, followed by what is probably a minor but developing low approaching Iceland from the NW.

The "mean max. wind" figures naturally reflect the anticyclonic character of type 214. At Vestmannaeyjar the values are - as always - higher than for any ^(other) station but still lower than for almost any other type; when relatively strong winds have occurred at Vestmannaeyjar on days referred to type 214, they have usually been from E or NE, to the S of the centre of the moving anticyclone. In November, relatively high values are obtained for some coastal stations in NW Iceland - mainly from the SW quadrant, under the influence of a low approaching from a NW direction. The overall frequency of gales is, however, very low, only 3.7% as

against 7-14% for nearly all other types; the few gales which occur are usually from the directions mentioned above, and are reported from exposed coastal station in S, NW and N Iceland.

Temperature. The temperature anomalies of the lower half of the troposphere, as testified by the figures for the 500 mb relative topography, show a considerable variation over the year; in winter (December to March) they are close to 0, but in April and May they are appr. +4°. At the surface the contrast between the core of the winter (January) and April is even stronger, as will be seen from the following description based on maps no 4.

In January type 214 is associated by moderately cold weather in most coastal areas of Iceland, with departures less than -3° at Grímsey, Hornbjargsviti and Vestmannaeyjar but between -4 and -5 at Raufarhöfn and Teigarhorn. In the interior the departures are generally much larger, exceeding -6 at several stations and culminating with -8° at Reykjahlíð. In February and March the geographical distribution is similar but the departures are smaller than in January, varying in February from 0 in the far NW to a little below -4 in the interior of E Iceland, and in March from appr. -1° at the westernmost stations to about -5 at the coldest stations of E Iceland. In April, however, the departures vary from 0° at the east coast to about +2 $\frac{1}{2}$ ° at several stations in the western half of the country, and in May from -2° at Teigarhorn to +1° in the interior of S Iceland. In spite of the relatively large number of days upon which these mean values were based, it seems rather likely that the values given for April might have been reduced, perhaps by more than 2°, if a much longer series had been available for the computation.

The picture obtained for the last three months of the year is much more consistent: a continuous cooling takes place, the departures at the westernmost stations decreasing from a little above 0 in October to about -1° in December, and in the interior of E Iceland more rapidly from about -2° in October to -5 in December. The continuity between December and January is very good, but it seems nevertheless possible that the January figures are 1 or 2° too low.

Maps no 5, showing the mean difference between daily extreme temperatures, all illustrate the important contrasts existing between coast and inland in an anticyclonic type like 214. On most of these maps, the largest differences are found at Reykjahlíð, where they vary between 7° (October) and 11° (May); but large values are also found at some stations near the coast, e.g. Þórustaðir (almost 9° in November and December) and Eyrarbakki (almost 9° in May), an indication that with this type the maritime influence may be quite limited even at stations situated very near the coastline. The smallest differences, about 4° on most of the maps, are found at a few exposed coastal stations such as Dalatangi and Vestmannaeyjar.

The values (mean max. minus mean min.) for November are relatively large at most stations. This does not, of course, indicate a large periodic diurnal amplitude of the temperature at that time of the year; rather, it may be associated with the large pressure tendencies shown on map no 2: after a cold, perhaps very cold day or night the temperature may rise rapidly with increasing SW or W wind.

Cloudiness. The thermal structure of the lower half of the troposphere, as described in the previous section, is such that minor inversions may easily form and, if once formed, may be preserved for some time. At such inversions larger clouds, mainly Sc and Ac, may be expected. This is confirmed by the relatively high amount of cloudiness at some of the northernmost stations (8-month average at Hornbjargsviti, Grímsey and Raufarhöfn about 6 oktas). On the other hand, the surface high, moving SE across Iceland, is often associated with divergence and subsidence, leading to a dissolution, partial at least, of Sc- and sometimes of Ac-clouds. Hence, the cloudiness is generally less in the interior and at the SE coast than farther N: the 8-month mean values of Reykjahlíð, Teigarhorn and Kirkjubæjarklaustur are between 4 and 5 oktas.

The picture outlined above is a simple one, and may be over-simplified. A more detailed study of the cloudiness figures reveal, if these figures are taken as representative, a number of complications. At most stations in W Iceland, for instance, the cloudiness appears to be much larger in November and December

than in January, but near the E coast the reverse is true; on a smaller scale, the May value for Hornbjargsviti is 6.4 oktas (higher than for any other station), but for the neighbouring station Þórustaðir only 4.0 oktas, among the lowest in all Iceland. Some such details may be spurious, but some are probably real, more or less, and may be caused by a complicated interaction between large-scale and meso-scale factors.

Precipitation. Like type 114, type 214 is very dry. The number of cases where a station received a monthly amount $\geq 50\%$ of the normal precipitation was 16 (as compared with 13 for type 124): 2 in January, 2 in February, 3 in March, 2 in May, 1 each in October and November and 5 in December, when one station, Reykjahlíð, registered an insignificant excess. With only one exception, these 16 cases all refer to stations in NE Iceland, mainly Reykjahlíð, Grímsstaðir and Raufarhöfn. In W and S Iceland and in the southern part of E Iceland the precipitation generally amounts to less than 20% of its normal value, and in some cases - mainly in January - to less than 0.1 mm per day referred to type 214.

The maps no 8, dealing with precipitation frequency, naturally confirm the picture obtained from maps no 7, but they add one feature, namely a minor difference between coast and inland: on most of these maps, frequencies (of amounts ≥ 1.0 mm) are extremely low, often 0, at most inland stations in W and S Iceland, but not quite as low at the coast. The maps for February, March, April and November show this contrast in a particularly striking manner.

Type 214 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	521	526	526	536	540			538	531	526		
Departure	-1	+2	+2	+8	+7			+3	+5	+3		

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar(8)	Lambavatn (8)
Hveravellir (6/6)	Hallormsst.(8)
Keflavík (6)	Hæll (7)
	Grímsstaðir(5)

C. Frequency and direction of gales ("maximum wind" \geq 30 knots).

Sum of possible number of days with a gale:

$$23 \times 210 - 131 = 4699$$

Actual number of days with a gale:

$$174 = 3.7\%$$

Distribution as to direction:

11	19	11
5		19
11		30
25		8
7	16	12

D. Severe gales.

No severe or widespread gale was reported on days referred to type 214. The highest wind velocity observed (at one of the four observations hours used for the present investigation) was 56 knots from due E at Vestmannaeyjar on 30 Nov. 1973.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm		cold
Keflavík	(7)	Grímsstaðir(7)
Þórustaðir	(6)	Hallormsst.(7)
Lambavatn	(6)	Teigarhorn (5)
Hornbjargsv.	(6)	Reykjahlíð (5)
		Raufarhöfn (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high		low
Lambavatn	(5)	Reykjahlíð (7)
Grímsey	(5)	Teigarhorn (6)
Keflavík	(5)	Kirkjub.kl.(6)
Eyrarbakki	(5)	Hallormsst.(6)
		Grímsstaðir(6)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large		small
Grímsstaðir	(8)	Hæll (6)
Raufarhöfn	(7)	Kirkjub.kl.(5)
Reykjahlíð	(6)	Fagurhólsm.(5)
Dalatangi	(5)	

H. Large daily amounts of precipitation.
No amount as large as 40 mm was reported from any of the stations used for the present investigation. The largest daily amount was 36,0 mm (Dalatangi, 25 Dec. 1969).

Type 215.

Number of cases month by month: 37,25,22,15,25;22,29,31. The mean values and frequencies obtained for January, November and December may, according to these figures, be considered as representative, and those for February, March, May and October are probably acceptable from this point of view, but in the case of April the representativeness may be rather poor.

Type 215 is characterized by NE winds - generally moderate - at the surface and NW winds at the 500 mb level. This implies cold-air advection. The temperature departures are negative throughout and mostly quite large; they are larger in the interior than at the coast, and larger in E than in W Iceland. The mean values of cloudiness ^{are} ~~is~~ not far from normal at some of the northernmost or easternmost stations, but generally low elsewhere - very low in January in the SW. In all western and southern parts of Iceland type 215 is dry or very dry, but a considerable area in ~~the~~ NE Iceland has ample precipitation in the first three and the last two months of the year, and receives about normal amounts in April, May and October.

Pressure and winds. The 500 mb mean maps show a moderately strong and rather straight NW (in May NNW) flow over the Icelandic region. The surface maps show, just as consistently, a NE current, sometimes fairly strong in the extreme S but generally moderate or rather weak elsewhere. The cold-air advection which is so evident from the monthly maps is an essential feature of this type and probably a regular concomitant even on individual days. The pressure tendencies are positive in E Iceland but in some cases negative in the W.

According to maps no 3, the "mean max. wind" velocities are moderately high at some exposed coastal stations but generally low elsewhere - in the interior of NE Iceland they are rather lower than might be expected from the isobaric maps, presumably because the formation of a ground inversion has reduced the vertical transport of momentum.

Gale frequency (i.e. the frequency of a max wind \geq 30 knots) is rather low, 7.1%; on 25 May days referred to this type altogether three cases were reported, all of them from Vestmannaeyjar and none of them exceeding 33 knots. 76% of all gales were from the NE sector (due N and due E included). For further details, see Supplement, sections C and D.

Temperature. With this type, arctic air has invaded Iceland, and - as mentioned above - cold-air advection is still going on. The temperature departures are negative throughout; the continuity from month to month is excellent, both with respect to the geographical distribution of the departures and their amounts. In the interior of NE Iceland the temperature deficiency varies between c. -5° in April and May and -7 - -8 in January. Except for October, the departures are larger at the NE coast, with onshore winds, than in the westernmost part of the country, where winds are blowing from the interior: at Raufarhöfn they vary from -4.0° in April to -6.4 in January, at Stykkishólmur from -2.0 in April to -5.3 in January. This should not be interpreted as a proof that the air is heated while moving across Iceland, but perhaps as a lag effect, insofar as the advection of cold air has not ceased and temperatures, presumably, are still sinking.

In its broad features the geographical distribution of the mean difference between daily max. and daily min. temperature, as shown by maps no 5, exemplifies the habitual contrast between inland and coast, with differences as large as 9° at some inland stations (Reykjahlíð, April; Síðumúli and Reykjahlíð, May) and as small as 3.5 at Dalatangi during February, May and October. Various details tend, however, to complicate this picture. As with several other types, some of the monthly values for Eyrarbakki and for Þórustaðir are higher, and for Stykkishólmur lower, than might have been expected (Eyrarbakki, May: 9.3° ; Þórustaðir, February: 8.5° (a few data are missing); Stykkishólmur, Jan. and Feb.: 3.8°). The only conclusion that may readily be drawn from figures like these is that with type 215 local factors may be of great importance, as far as temperature is concerned.

Cloudiness. The absolute humidity of the arctic air invading Iceland from the NE is, of course, low, but low clouds are often formed while it moves over open water and sometimes because of forced lifting when it enters the more or less mountainous parts of Iceland. Mean cloudiness for most of the coastal stations from Hornbjargsviti to Dalatangi are high enough (on an average 6 oktas or more) to confirm this. However, under the influence of the anticyclone which according to map no 2 is centred off NW Iceland, subsidence prevails in the lower part of the troposphere, and often leads to bright weather with little or no clouds, in particular in SW Iceland where the air has a long overland trajectory. In Reykjavík, for example, the mean cloudiness on days referred to type 215 varies from 2.7 in January and 3.4 in October to 5.4 in April; the January value is one of the lowest obtained for any station, type and month. Taking the effect of friction into account, Grímsey, with a mean cloudiness of 7.0 in January, is roughly on the same trajectory as Reykjavík. The efficiency of the cloud-dispersing mechanisms may also be shown by other, more adjacent pairs of stations, e.g. Dalatangi and Teigarhorn, where the 8-month averages are 6.1 and 4.3 oktas respectively.

Precipitation. As far as precipitation amounts accompanying type 215 (expressed as a percentage of normal amounts) are concerned, Iceland may conveniently be divided into two parts: NE Iceland (represented by the stations Reykjahlíð, Grímsstaðir and Raufarhöfn) which is rather wet, and the rest, which is dry. The boundary may be said to fluctuate slightly from month to month but is generally a little W of Grímsey, close to Akureyri, definitely N of Hallormsstaður and close to Dalatangi. The mean daily amounts of precipitation, in mm and in % of normal daily amounts, for three groups of stations, one in the wet area mentioned above, one in W and one in S Iceland, are given in the following table.

		J	F	M	A	M	O	N	D	8-month average
A (NE Iceland)	mm	2.2	2.1	1.4	1.1	0.4	1.2	2.4	2.3	1.6
	%	197	221	178	133	76	79	203	197	161
B (W Iceland)	mm	0.4	0.3	0.6	0.7	0.1	0.1	0.3	0.7	0.4
	%	19	15	36	50	4	4	14	38	22
C (S Iceland)	mm	0.3	0.4	1.2	1.4	0.8	0.1	0.4	0.3	0.6
	%	8	11	29	42	25	2	7	5	14

The stations selected for computing the mean values were, for A: Reykjahlíð, Grímsstaðir and Raufarhöfn; for B: Síðumúli, Stykkishólumr and Hlaðhamar; for C: Fagurhólsmýri, Kirkjubæjar-klaustur and Hæll.

Beyond the main features described above, some further facts may be read from the table.

(1) The surplus of precipitation in NE Iceland is largely confined to the months November to March. May and October are relatively dry months even in this part of the country.

(2) In W Iceland, May and October are particularly dry as far as type 215 is concerned, whereas March, April and December receive one third to one half of the normal amount of precipitation.

(3) In S Iceland, all months from October to February are very dry; March and May are less dry and April is seen to receive more than a third of the normal amount. It may be stressed that the actual amounts of precipitation in April and May are larger in S Iceland than in the "wet" area in NE Iceland.

Going outside the areas discussed above, it may be noted that a strong gradient is found at the coast between Dalatangi and Teigarhorn during the whole period October to February, and also that Vestmannaeyjar is less dry than other stations in SW Iceland in February and April.

The maps no 8 all show a large or fairly large area with few precipitation days in the western, central and southern parts of Iceland. The size of this area (characterized by the frequency of 1.0 mm precipitation of more being less than 10%) varies a good deal from month to month; in May it comprises appr. 90% of the country. On the other hand, most of the maps show an area of relatively high precipitation frequency in the coastal region of NE Iceland; in Raufarhöfn, more than 50% of all days in January, February, April, November and December received more than 1.0 mm, and the figures for Dalatangi are similar. It is characteristic for this type, however, - with precipitation mainly in the form of snow from November to April or May - that amounts of 10 mm or more are infrequent even in those areas where small or moderate amounts are frequent.

Type 215 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	509	511	515	519	528					525	516	510
Departure	-13	-13	-9	-9	-5					-10	-10	-13

B. Stations where the "mean_max-imum_wind" is relatively high low

Vestmannaeyjar (8)	Reykjahlíð (8)
Hveravellir (7)	Þórustaðir (8)
Dalatangi (6)	Hallormsst. (7)
Keflavík (5)	Lambavatn (6)
Raufarhöfn (5)	Hæll (6)
	Grímsstaðir (5)

C. Frequency and direction of gales ("maximum wind" ≥ 30 knots). Sum of possible

number of days with a gale:
 $23 \times 206 - 96 = 4642$
 Actual number of days with a gale:
 $329 = 7.1\%$

Distribution as to direction:

191 86 46

D. Severe gales.

A wind velocity ≥ 60 knots was reported on five occasions, but each time only from Vestmannaeyjar (January: 2 cases, April: 1, December: 2); the wind direction was N in one case, E or ESE in four. A velocity ≥ 70 knots was reported once, on 25 Dec. 1966 (90° 74 knots).

3	72
4	45
6	22
7	19

(215 S)

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Vestmannaeyjar(7)	Grímsstaðir(8)
Lambavatn (6)	Reykjahlíð (8)
Keflavík (5)	Akureyri (7)
Þórustaðir (5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Raufarhöfn (8)	Teigarhorn (6)
Grímsey (6)	Reykjavík (5)
Dalatangi (6)	Kirkjub.kl.(5)
Hornbjargsv.(6)	Vestmanna.(5)
	Siðumúli (5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Raufarhöfn(8)	Fagurhólsmýri(6)
Reykjahlíð(8)	Teigarhorn (6)
Grímsst. (8)	Lambavatn (5)
Grímsey (5)	Stykkishólmur(5)
Akureyri (5)	

H. Large daily amounts of precipitation (≥ 40.0 mm). An amount of at least 40 mm was reported in one case only: Eyrarbakki, 13 Feb. 1970, 51.2 mm.

Type 216.

Number of cases month by month: 10, 18, 25, 27, 35; 26, 21, 23.
In view of the large differences shown by these numbers, the representativeness of the mean values and frequencies must be assumed to vary considerably: it is probably very good in May and may be very poor in January.

The 500 mb maps show a deep cyclone situated over the sea NE or E of Iceland. At the surface the low is, as might be expected, farther E, perhaps near the Norwegian coast. Arctic air, very cold throughout the troposphere, has invaded Iceland with N or NE winds which are or have been quite strong at exposed places; they are now, as shown by the pressure tendencies, usually decreasing. Temperatures are far below normal; in fact, type 216 is equalled by only one or two other types in this respect. The northerly winds bring cloudy weather to N Iceland and relatively large amounts of precipitation in the NE, but in the S half of the country weather is usually dry and often very bright.

Pressure and winds. According to the 500 mb maps a deep trough is situated E of Iceland, near the longitude of the Faroes or somewhat farther E. The main centre (which may sometimes be the principal cyclonic vortex of the N hemisphere) is located on some of the maps in the vicinity of Jan Mayen, on others (April in particular) farther S, near the latitude of Iceland. Near the surface of the earth winds are N or NE over Iceland, usually with a rather well-marked anticyclonic curvature which indicates that the surface low, as usually, is farther E than the 500 mb cyclonic centre - perhaps as far E as northern Scandinavia or the sea between Nordkap and Spitsbergen. A high is approaching Iceland from the NW; on most monthly maps the largest rise in pressure is taking place in E Iceland, an indication that the wind, still rather strong at exposed places, may be expected to decrease during the day.

According to maps no 3 ("mean max. wind") the highest wind velocities are found, as usual, at Vestmannaeyjar, but some of the values obtained for other stations are also rather high; Reykjavík and Stykkishólmur in January, Keflavík and Raufarhöfn in February, Dalatangi and Teigarhorn in December - to give a few examples - are all of the order of 23-24 knots. For nearly all other types, the "mean max. wind" values are a good deal higher for Fagurhólsmýri than for Kirkjubæjarklaustur, but in the case of 216 and 316 this does not hold true: in particular, the

December and February values for Fagurhólsmýri are surprisingly low. It may perhaps be concluded that with these two types a lee vortex is often formed to the SW of Vatnajökull. The gale frequency (11.2% as defined) is close to the all-type mean value; most of the gales (68%) were from the sector NW to NE. Further details regarding severe or widespread gales are given in the Supplement.

Temperature. The arctic air invading Iceland when type 216 prevails is very cold at the surface, and in the free atmosphere as well; the mean temperature departure of the layer between 1000 and 500 mb is as large as -7 - -9° during seven of the eight months concerned, and -6° in May. This implies that no other type except 316 is colder than 216.

Broadly speaking, the departures shown by the maps no 4, although large, are not quite as large as those indicated by the departures of the relative topography. Before the air has arrived at the north coast of Iceland, it has usually travelled across an area of open water and has thus become a little warmer near the surface. At the same time clouds have usually formed, which - together with the moderately strong wind - prevent a rapid cooling of the surface layer over N Iceland. Further S the clouds are usually dispersed, but the radiative cooling is counterbalanced to some extent by adiabatic heating when the air descends towards the S and W coast.

The departures at the surface, according to maps no 4, are found rather consistently to be largest in an area extending from NE to SW across central Iceland. In this area they amount to -8 or -9° in November and January, -6 to -8 in March and December and mostly -5 to -6° in February, April and October. The month-to-month variations indicated by these figures are probably partly fictitious, but the culmination in mid-winter may be considered as real.

The smallest departures are found along the coast of E and SE Iceland where they range from -3 or -4° in October and May to about -6 in November and December. It is interesting to note that from October to March another area of relatively small departures is found on the N coast. In the following table this area is represented by Hraun:

Mean temperature departure, type 216

	J	F	M	A	M	O	N	D
Hornbjargsviti	-6.9	-5.0	-7.4	-4.2	-4.1	-4.1	-6.7	-6.2
Hraun	-5.6	-4.1	-5.5	-4.3	-4.5	-3.6	-5.7	-5.4
Grímsey	-7.8	-4.8	-6.3	-4.0	-4.0	-4.4	-6.3	-6.2

The reason for the relative mildness of Hraun is probably that in this case the trajectory over water is somewhat longer than at Hornbjargsviti and Grímsey. In April and May, when the water is relatively cold and the occurrence of ice near the N coast of Iceland relatively frequent, Hraun is rather cold in connection with this type.

The picture obtained from maps no 5 is to some extent depending on the season. During the period November to February the largest differences between mean maximum and mean minimum temperature are found in the interior where they amount to about 6°, as against 4 or 5° at most of the coastal stations; as in other similar cases, the amplitude is mainly a result of variations during a 24-hour period of wind velocity and cloudiness, and has little or nothing to do with the diurnal range of incoming radiation. In April and May, on the other hand, abundant sunshine gives rise to moderately high day temperatures in most of S Iceland, ^{whereas} - in May in particular - cloudy and cold weather prevails in N Iceland; hence, with night temperatures low everywhere, the largest max.-min. differences, 7-8°, are found in S Iceland, in some cases at the S coast itself as the wind is northerly or northeasterly. October and March take an intermediate position with respect to these geographical differences.

The following table shows how the max.min. differences increase at Eyrarbakki, on the S coast, from February to May, and how it decreases sharply at Grímsstaðir from April to May:

	F	M	A	M
Grímsstaðir, \bar{t}_x and \bar{t}_n	-7.6, -14.0	-7.3, -13.4	-0.3, -5.9	3.3, -1.3
" $t_x - t_n (G)$	6.4	6.0	5.6	4.6
Eyrarbakki, t_x and t_n	-3.4, -8.6	-1.6, -9.0	1.5, -6.3	7.9, -1.7
" $t_x - t_n (E)$	5.2	7.4	8.0	9.6
E in % of G	81	123	143	207

The apparent discrepancies in the table above are due to rounding-off effects and to the incompleteness of one of the series.

Cloudiness. As regards cloudiness, type 216 is characterized by striking contrasts between N and S Iceland, as may be seen from the following table.

Mean cloudiness, type 216 (oktas)

	J	F	M	A	M	O	N	D
N Iceland (A)	7.2	7.1	7.1	6.3	6.8	7.0	7.1	7.1
S Iceland (B)	3.4	4.3	3.5	4.4	4.1	3.6	3.1	3.4
B:A, %	47	61	49	70	60	51	44	48

The stations used for the computation of the mean values were, for A: Hraun, Grímsey, Akureyri, Grímsstaðir and Raufarhöfn; for B: Teigarhorn, Kirkjubæjarklaustur, Vestmannaeyjar, Eyrarbakki and Reykjavík.

According to the table, the cloudiness in S Iceland is only about half that in N Iceland, except in April when the difference is relatively small. (Some of the details shown by the figures may not be representative.)

Choosing 5.5 oktas as a suitable boundary between the areas of large and small cloudiness, respectively, it may be seen from the maps that this boundary extends from a point between Þórustaðir and Lambavatn in the NW, passes between Hlaðhamar and Síðumúli and continues eastwards to a point between Dalatangi and Teigarhorn. (The cloudiness variations from month to month are somewhat irregular, and some of them are probably not real.)

Precipitation. As type 216 is characterized by ^acyclonic circulation in the middle of the troposphere, which is habitually accompanied by frequent rain or snow, but also by very low temperatures, which usually means small amounts of precipitation, it is not self-evident whether 216 should be a dry or a wet type or something in-between. The answer is - as in several similar cases - that on one side of a rather well-defined boundary it is wet, on the other side it is dry. The "wet" area ("wet" is a little misleading as precipitation most of the year - as early as October and as late as May - is mainly in the form of snow, at temperatures below freezing point) covers the northeasternmost part of Iceland, about 10-25% of the entire land area. In May this area is relatively small, with Akureyri a little west and Dalatangi a little south of its boundary; on the other hand, it extends westwards as far as the Húnaflói area in November and December.

The boundary is very well-marked at the east coast, as seen from the following figures:

	F	F	M	A	M	O	N	D	mean for 8 months
Dalatangi, mm	4.4	3.8	3.6	3.8	2.3	6.0	8.3	9.0	41.2
Teigarhorn, mm	0.1	0.2	0.5	1.8	0.0	1.9	0.7	1.2	6.4
T:D, quotient	0.02	0.05	0.14	0.47	0.02	0.32	0.08	0.13	0.16
Dalatangi, % of norm.	110	127	124	115	85	130	166	176	135
Teigarhorn, % of norm.	2	6	16	67	1	41	17	26	22

Although the figures for April and May ought to be fairly representative, the true difference between these months may be less than indicated.

The boundary may be almost as clear-cut during some months in NW Iceland, but there it seems to fluctuate a good deal: the percentage figures for Hornbjargsviti vary between 33 (November) and 108 (March), for Þórustaðir between 23 (February) and 69 (January), for Lambavatn between 4 (March) and 38 (October).

In NE Iceland the corresponding figures, although consistently >100, vary even more; the variations may be a little misleading as the denominator is so small in this area where winter precipitation is generally rather low. The largest percentage figures are generally those for Raufarhöfn (roughly 650 in March, 450 in December, 400 in April, 350 in January, February and November), but the highest figures for Grímsey, Akureyri and Reykjahlíð are roughly within the same range.

In the dry region comprising SE, S and SW Iceland and the Breiðafjörður district, the percentage values are mostly within the range 10-40% but an area with less than 10% is found somewhere on most of the monthly maps and in January covers SE Iceland from Vestmannaeyar to beyond Teigarhorn.

If the maps no 8, showing precipitation frequencies, are compared with maps no 7, the impression is confirmed that in parts of Iceland this type may give frequent rather than abundant precipitation: on several of the monthly maps there is a fairly large area where although more than 30% of the days receive at least 1.0 mm of precipitation, the monthly means still fall short of the monthly normals. Good examples of this are found in January, February, October, November and December, mainly in MW Iceland.

The largest frequencies of amounts ≥ 1.0 are usually found on the coast of NE Iceland (Dalatangi, Raufarhöfn); in December, about 60% of all days receive at least 5.0 mm of precipitation at these stations. Within the dry area, on the other hand, during some months (January and May in particular) several stations have measurable precipitation on less than 15% of all days.

Type 216 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	D
Rel. top.	506	508	507	514	521	520	509	506	
Departure	-16	-16	-17	-14	-12	-15	-17	-17	

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar(8)	Pórustaðir(8)
Raufarhöfn (6)	Reykjahlíð(8)
Dalatangi (6)	Lambavatn (7)

D. Severe gales (≥ 60 knots).

A wind velocity ≥ 60 knots was reported on 7 occasions (Jan.: 1, Feb.: 3, April: 1, Oct.: 1, Nov.: 1) from the following stations: Vestmannaeyjar 4 cases, Teigarhorn 2, Fagurhólmsmýri 1. The wind direction was NNW-NNE, except in one case when it was W. The highest velocity was reported from Fagurhólmsmýri: 20° 67 knots on 28 April 1973, but the most notable case as far as the geographical extension is concerned is a northerly gale all over Iceland on 12-13 February 1973.

C. Frequency and direction of gales ("max. wind" ≥ 30 knots). Sum of possible

number of days with a gale:

$$23 \times 185 - 118 = 4137$$

Actual number of days with a gale:

$$463 = 11.2\%$$

Distribution as to direction:

	68	168	77
4			106
3			14
3			10
		2	8

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm		cold	
Dalatangi	(8)	Grímsstaðir	(8)
Fagurhólsmýri	(7)	Reykjahlíð	(7)
Hraun	(6)	Hveravellir	(5/7)
Teigarhorn	(5)	Síðumúli	(6)
Kirkjubæjarkl.	(5)	Eyrarbakki	(5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high		low	
Grímsey	(8)	Kirkjub.kl.	(8)
Raufarhöfn	(8)	Vestmannaeyjar	(8)
Grímsstaðir	(7)	Reykjavík	(8)
Hraun	(6)	Eyrarbakki	(7)
Akureyri	(6)	Teigarhorn	(5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large		small	
Raufarhöfn	(8)	Fagurhólsmýri	(7)
Reykjahlíð	(8)	Kirkjubæjarkl.	(6)
Akureyri	(7)	Stykkishólmur	(5)
Grímsstaðir	(6)		
Grímsey	(6)		
Dalatangi	(5)		

H. Large daily amounts of precipitation (≥ 40.0 mm).

An amount of precipitation slightly exceeding 40.0 mm was measured on three occasions only:

- Raufarhöfn, 11 March 1966, 42.3 mm;
- Dalatangi, 25 March 1971, 42.3 mm;
- Vestmannaeyjar, 30 Oct. 1961, 40.1 mm.

Type 224.

Number of cases month by month: 24,25,28,20,23;13,13,22.
The figures for October and November are quite small, which means that the mean values and frequencies obtained for these months may not be representative. For all other months the representativeness may be assumed to be fairly good.

Type 224 is characterized by a well-developed anticyclone or ridge of high pressure near the longitude of Iceland. In the free atmosphere it is definitely a warm anticyclone or ridge, but during most of the eight months here concerned the temperature departures at the surface, although generally positive, are not large; in E Iceland most of the departures are in fact negative in November and January. This is understandable in view of the fact that this part of the country has usually light winds and often bright weather when type 224 prevails, whereas the coastal areas of W Iceland have much larger amounts of cloud. The amounts of precipitation are below normal everywhere, even on the coast of SW Iceland where light rain, sleet or drizzle is relatively frequent; in the interior and in the NE, type 224 is a very dry type.

Pressure and winds. Type 224 is strongly anticyclonic. Some of the monthly mean maps for 500 mb (for February and May in particular) indicate the presence of a closed and presumably blocking high near the S coast of Iceland, whereas others, the map for November above all, rather give the impression of a ridge of high pressure, not necessarily blocking, near the longitude of Iceland. The surface maps all show a high off the coast of SE Iceland, with moderate or locally strong E and SE winds in the southwesternmost part of the country and mainly light winds between SE and SW elsewhere. The pressure tendencies indicate that the high is usually declining or moving away to the E. According to maps no 3, the "mean max. winds" are moderately strong at Vestmannaeyjar in October - November and January - March, but otherwise rather light and in many interior districts very light indeed. Gale frequency is low except at Vestmannaeyjar, but some of the easterly gales reported from that station were severe and one of them of exceptional violence, as stated in the Supplement, item D.

Temperature. The temperature departures of the lower half of the troposphere (see Supplement, item A) are consistently large: $+4 - +4\frac{1}{2}^{\circ}$ in October - November and February to May and about $+6^{\circ}$ in December and January. At the surface of the earth the departures are less than that - somewhat less, according to maps no 4, in March and April, and much less, in fact partly negative, in November and January, the four remaining months taking intermediate positions in this respect. There is a well-marked difference between W Iceland, which is a comparatively warm area, and E Iceland, which is cooler, as shown by the following figures:

Mean temperature departure, type 224.

	J	F	M	A	M	·	O	N	D
W Iceland (A)	+2.3	+2.8	+3.5	+4.1	+1.8		+2.7	+0.9	+3.3
E Iceland (B)	-0.4	+0.0	+1.0	+2.2	+0.2		+0.3	-2.1	+0.6

The stations selected for the computation of these mean values were the following: for A, Þórustaðir, Síðumúli and Hæll; for B, Raufarhöfn, Hallormsstaður and Teigarhorn.

As indicated by the figures above, the largest positive departures, about $+4^{\circ}$, are found in April (in parts of W-central and NW Iceland). The departures are negative at a few stations in E Iceland in February, at the E coast in May, in a rather large area in NE Iceland in January, and everywhere E of a line from Húnaflói to Kirkjubæjarklaustur in November, but only in the latter month are the departures of the order of -2° at some stations.

The essential difference between mild or rather mild weather in W Iceland and lower temperatures in most of E Iceland is associated with the gradual transition, under the influence of subsidence and relatively calm weather, of mild Atlantic air over the interior of Iceland - in particular in the E part where the conditions for radiational cooling are often rather good when type 224 prevails.

Maps no 5 show a very great contrast, largely explicable by the differences with respect to cloudiness as described in the following section, between the coast of SW Iceland and the interior of E Iceland. At Vestmannaeyjar, e.g., the mean difference between daily max. and daily min. temperature varies between 2.5 and 3.1° except in November when the mean value (based on 13 cases only) is 3.7° ; at Hallormsstaður, on the other hand,

it varies between 7.0° (January) and 10.8° (April). An area where the difference concerned exceeds 8° is found in the interior of E Iceland on all maps except those for December and January, and extends westwards as far as Síðumúli in May. Relatively low values, mostly $4-5^{\circ}$, prevail at the coastal stations in the Faxaflói-Breiðafjörður area, in the interior of S Iceland (except in April and May) and at Grímsey, whereas the stations along the E coast, with frequent off-shore winds, have relatively large values (7° at Raufarhöfn and Teigarhorn in April)

Cloudiness. For the country as a whole, the mean cloudiness on days referred to type 224 is not far from the climatological average of about 6 oktas, but the geographical differences are large and consistent. In southern Iceland and in the coastal areas of W Iceland all or nearly all monthly means are within the range 6 - 7.5 oktas; in the interior, and more particularly in the area between Eyjafjörður and the mountains near the east coast, most or all months have mean values ranging between 4 and 5.5 oktas, in a few cases even less than 4 (Reykjahlíð: Feb. 3.6, May 3.3 oktas). A few stations take an intermediate position, with monthly mean values between 5 and 6.5 oktas: Hlaðhamar, Hraun, Grímsey and Raufarhöfn. The variations shown from month to month are somewhat irregular and probably to some extent fictitious but it may be mentioned that April, apparently, is much more cloudy than May, and also that the geographical contrasts described above seem to be particularly large in November, December and February.

Precipitation. The monthly amounts of precipitation are, as shown by maps no 7, with hardly any exception, less than the normal amounts, and most of them fall within a rather narrow interval: 20-50% of the climatological normals. Less than 20%, in fact less than 5, is recorded almost everywhere in May; the dryness shown on the map for May is equalled or slightly surpassed on one other map only, namely that for type 114, April. Less extensive but still considerable areas with less than 20% are found in January, February and November, mainly in the interior but in November also at the east coast. Areas receiving more than 50% are found on all maps except the one for May,

most often in the coastal regions of southern and western Iceland, but in a few cases (January, March and April) in NE Iceland, too, and in December mainly in the interior. The highest monthly figure obtained for any station is 129% at Vestmannaeyjar in January.

In view of the small amounts characteristic of type 224 it is a little surprising to find that the precipitation frequencies (of amounts ≥ 0.1 and ≥ 1.0 ^{mm}), according to maps no 8, are moderately high in some parts of the country, in particular in the coastal areas of S and SW Iceland. An area where 30-50% of all days receive at least 1.0 mm is found on all maps except that for May, and usually extends, more or less continuously, along the coast from Lambavatn in NW to Kirkjubæjarklaustur in SE; in October, the three southernmost stations receive 1.0 mm or more on 50-70% of all days referred to type 224. On the other hand, in the eastern, northern and interior parts of Iceland the precipitation frequencies are about as small as might be expected. Areas where the frequency of a daily amount ≥ 1.0 mm is less than 10% are found on all monthly maps; they are large in February and November and cover virtually all Iceland on the map for May. (As usual in this connection, it can not be claimed that all irregular month-to-month variations are real.)

Type 224 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	533	532	532	537	542	543	535	537	543	535	537	537
Departure	+11	+8	+8	+9	+9	+8	+9	+14	+8	+9	+9	+14

B. Stations where the "mean_maximum wind" is relatively high low

- Vestmannaeyjar (8) Teigarhorn (8)
- Fagurhólsmýri (8) Reykjahlíð (8)
- Hveravellir (4/4) Hallormsst. (7)
- Keflavík (7) Þórustaðir (7)
- Reykjavík (7) Lambavatn (5)

C. Frequency and direction of gales ("max. wind" \geq 30 knots). Sum of possible

number of days with a gale:
 $23 \times 168 - 126 = 3738$
 Actual number of days with a gale:
 $186 = 5.0\%$

Distribution as to direction:

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported on 6 occasions, 3 in January and 5 in February.

One report came from Hveravellir, all others from Vestmannaeyjar. The wind direction was ENE-ESE (70-110°) in all cases. The highest wind velocity was quite exceptional: on 2 Feb. 1966, an easterly wind of 88 knots was reported from Vestmannaeyjar.

	3	1
3	26	57
6	33	33
8	21	28

(224 -S)

- E. Stations which, according to the anomalies of monthly mean temperature, appear as
- | warm | cold |
|------------------|----------------|
| Þórustaðir (7) | Dalatangi (8) |
| Síðumúli (6) | Teigarhorn (8) |
| Hæll (6) | Hallormsst.(6) |
| Hveravellir(3/4) | Raufarhöfn (6) |
| Lambavatn (5) | |
- F. Stations whose monthly means of cloudiness, compared with those of other stations, are
- | high | low |
|-------------------|----------------|
| Lambavatn (7) | Grímsstaðir(8) |
| Keflavík (6/7) | Reykjahlíð (7) |
| Vestmannaeyjar(6) | Hallormsst.(7) |
| | Dalatangi (5) |
| | Teigarhorn (5) |
- G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as
- | large | small |
|-------------------|---------------|
| Kirkjubæjarkl.(8) | Grímsey (5) |
| Vestmannaeyjar(6) | Þórustaðir(5) |
| Keflavík (6) | Reykjahlíð(5) |
- H. Large daily amounts of precipitation (≥ 40.0 mm).
An amount ≥ 40.0 mm was reported on two occasions only:
- 9 Jan. 1968, Vestmannaeyjar:
46.6 mm;
- 12 Jan. 1968, Fagurhólsmýri:
45.7 mm.

Type 225.

Number of cases month by month : 20,23,14,26,16;25,21,17.
The representativeness of the mean values and frequencies discussed below is probably poor or rather poor for March, May and December but fairly acceptable for the remaining five months.

Of the 27 types discussed in the present investigation, type 225 is unique insofar as it is the only type where each of the three parameters used for the grouping has a value rather close to its median value. It is not surprising, therefore, that several of the maps referred to type 225 show conditions resembling the climatologically normal state of the atmosphere.

On most of the 500 mb maps Iceland is seen to be on the western flank of a moderately strong ridge. On the maps for January to May the curvature of the streamlines is decidedly anticyclonic. According to the surface maps the winds are mainly E in the area of Iceland - relatively strong at the south coast, less vigorous and more variable in N Iceland. Temperature departures are small and mainly positive in the southern and westernmost parts of Iceland from February to May, but otherwise mainly negative and small or moderate. The cloudiness figures are rather inconclusive but do indicate an excess of cloudiness at the northernmost stations. As for precipitation, small or moderate deficiencies prevail over large areas; an area with rather large deficiencies is found on all monthly maps, and its extension is large in January and February. Areas where precipitation is abundant are shown on the maps for January and May in NE Iceland, but the supporting evidence for the existence of such areas is rather weak.

Pressure and winds. As the days referred to type 225 have geostrophic wind components at the 500 mb level close to their ~~respective median values~~ it is not surprising that most of the monthly maps ~~no. 1~~ show the upper winds over the Iceland area to be westerly and southwesterly, but it was not anticipated that the maps for January to May should show a more or less well-marked anticyclonic curvature. The 12-hour pressure changes, as usual, indicate a trend of development, but the indication thus obtained for the various months is inconsistent: the tendencies are negative (small or moderate) in January, February, March, October and

November, but positive and rather large in December. Although the predominance of negative tendencies may seem convincing, the safest conclusion is probably that the amount of data for some of the months (including December) is not sufficient to give representative mean values in this particular case.

As might be expected, the "mean max. wind" values shown on maps no 3 are not far from their overall monthly average values. The contrast between coastal stations and most stations in the interior is clearly seen, in S and E Iceland at least, but it is noteworthy that the values obtained for Hveravellir are as large as for any of the coastal stations except Vestmannaeyjar. The gale frequency, 11.5% as defined, is close to the overall average, but it is conspicuous that the direction of the gales was E or ENE (50-100°) in no less than 58% of all cases. A majority of the severe gales occurring on days referred to type 225 was reported from Vestmannaeyjar.

Temperature. Maps no 4, showing the average departures of the daily mean temperature from the monthly normals, are not as inconclusive as might have been expected. In the first place, the departures are negative, almost without exception, in northern Iceland; besides, they are rather large in November and December in the interior. In S and SW Iceland the departures are mostly between $-\frac{1}{2}$ and $+1^\circ$ during the first five months of the year and generally between 0 and -2° from October to December. The largest negative departures, about -4° , are found in December in the interior of NE Iceland, but those for November are not much smaller.

The mean difference between daily max. and daily min. temperature are mostly between 3 and 5° at the coastal stations and between 5 and 7° in the interior of Iceland. During the first few months of the year, February in particular, they are relatively large at the north coast, presumably because land breezes may develop in this area of weak gradients; the February value for Raufarhöfn, 6.9° (mean max. -0.2 , mean min. -7.1) is twice as large as that for Vestmannaeyjar (mean max. 4.1 , mean min. 0.7), although the mean cloudiness at the two stations is the same. The largest mean values of $t_{\max} - t_{\min}$ are found in February in the interior of NE Iceland (Reykjahlíð 9.3 , Hallormsstaður 8.6°).

Cloudiness. The cloudiness maps (no 6) show, more pronouncedly than the other maps illustrating the weather associated with type 225, a picture which seems appropriate to a type with no clearly distinguishing character. The mean values are mostly between $5\frac{1}{2}$ and $6\frac{1}{2}$ oktas in the interior and between 6 and 7 oktas at the coastal stations, the north coast being somewhat more cloudy than the east, south and west coasts. Among the individual months, October is noteworthy for high cloudiness figures everywhere, from 6.3 oktas in Reykjavík to 7.7 at Dalatangi; it is doubtful, in spite of the relatively large number of cases on which these figures are based, to what extent this result may be taken as representative.

Precipitation. 225 is a rather dry type. One half of the figures expressing the amount of precipitation in % of the normal amount fall within the interval 35 to 90%, and the median value is close to 65%. Areas with relatively large deficiencies - receiving less than 25% of the normal amount - are found on all maps, but their location and size vary in a manner which may seem rather capricious: in January and February they cover a large, mainly interior part of Iceland, whereas in March, October and November only 1-3 stations in the coastal area of NW Iceland, and in April only Dalatangi, receives less than 25%. The distribution shown on the map for May is quite peculiar: the percentage increases eastwards from 10% at Þórustaðir to more than 300% at Reykjahlíð; unexpectedly Hallormsstaður has a very low figure (11%), but Dalatangi and Teigarhorn again have figures as high as 120-150%. It is worth noting that the number of days in this case is rather low (16), and the distribution just mentioned can hardly be representative.

Areas with a surplus are also found on all monthly maps; they are not quite as variable with respect to location and size as the area showing a large deficiency. At Raufarhöfn, seven out of eight months show a surplus, culminating with almost 150% in January but otherwise moderate or rather small (10-70%); the surplus area has its largest extension in May (see above), when it comprises most of E Iceland. In the extreme SW, a minor surplus as found at Vestmannaeyjar from February to May, and at

one more station, at least, during most of these months.

The description given above indicates a certain tendency: precipitation is not far from normal at the northeasternmost and the southwesternmost stations, but otherwise, excepting May, it is generally deficient. This tendency is largely confirmed by the maps no 8, showing precipitation frequencies, but it is curious to note that in this case it is December rather than May that shows a different picture; to be specific, December is the only month when, according to the available data, the frequency of an amount of precipitation ≥ 1.0 mm is at least as large in the interior of Iceland as in the coastal areas.

Small areas where the frequency of an amount of precipitation ≥ 1.0 mm is less than 10% are found on all maps except those for April and December, but a closer study of the maps concerned reveals that in several cases only one station confirms the existence of such an area. On the other hand, the said frequency exceeds 50% at one station at least on all monthly maps and mainly in coastal areas; at the following stations the frequency is shown to be 50% or more on three monthly maps: Hornbjargsviti, Raufarhöfn, Dalatangi, Kirkjubæjarklaustur and Vestmannaeyjar.

Large amounts of precipitation are infrequent everywhere in Iceland in connection with this type (see Supplement, item H).

Type 225 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	520	521	524	527	533					531	524	521
Departure	-2	-3	0	-1	0					-4	-2	-2

B. Stations where the "mean max-
mum wind" is relatively
high low

Vestmannaeyjar(8)	Þórustaðir(8)
Hveravellir (8)	Reykjahlíð(7)
Fagurhólsmýri (8)	Hallormsst(7)
	Skúmsst. (5)
	Akureyri (5)

C. Frequency and direction of
gales ("maximum wind" ≥ 30
knots). Sum of possible

number of days with a gale:

$$23 \times 162 - 82 = 3644$$

Actual number of days with
a gale:

$$420 = 11.5\%$$

Distribution as to direction:

	12	27	27
4			141
.			103
8			48
2	11	37	

D. Severe gales (≥ 60 knots).

A wind velocity of 60 knots or more was reported on 12 occasions: 5 in January, 4 in February, 2 in March and 1 in November.

Nine reports came from Vestmannaeyjar, and one from each of the following stations: Reykjavík (29 Jan. 1966: 20° 60 knots), Hornbjargsviti (50° 68 knots on the same day), Hveravellir (15 Feb. 1975: 170° 60 knots).

In the cases recorded at Vestmannaeyjar, the wind direction was 90-110°, except once, when it was 160°. The highest velocity was registered on 15 Nov. 1970: 110° 77 knots at Vestmannaeyjar, but the most widespread gales of notable severity were those occurring on 29 Jan. 1966.

(225 S)

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Vestmannaeyjar(8)	Akureyri (7)
Fagurhólsmýri (6)	Hallormsst.(6)
Hæll (5)	Grímsstaðir(6)
Kirkjubæjarkl.(5)	Reykjahlíð (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Hornbjargsv.(7)	Reykjavík(5)
Raufarhöfn (7)	Grímsst. (5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with correspondent figures for other stations - as

large	small
Raufarhöfn (6)	Stykkishólmur(7)
Vestmannaeyjar(6)	Þórustaðir (5)
Grímsstaðir(5)	Síðumúli (5)

H. Large daily amounts of precipitation (≥ 40.0 mm). Among the stations used for this investigation, only two such cases have occurred: Teigarhorn, 22 May 1965: 49.4 mm; Vestmannaeyjar, 14 Jan. 1968: 41.5 mm.

Type 226.

Number of cases month by month: 24, 16, 21, 25, 23; 23, 34, 25.
According to these figures it may be assumed that the representativeness of the mean values and frequencies discussed below is rather poor in the case of February, good in the case of November and acceptable in all other cases.

Type 226 is characterized by a complete reversal of the flow between the surface of the earth and the middle of the troposphere: at the surface the wind is NE, with an anticyclonic curvature, and at the 500 mb level SW, with a cyclonic curvature. Such a situation is likely to arise towards the end of a period with intense cyclonic activity over the Icelandic area. At the rear of one or more deep cyclones arctic air is flowing from the sea east of N Greenland across Iceland and further SW; a high may be developing over N Greenland but it is not, so far at least, of the warm, blocking type. Temperatures in Iceland are low or rather low. Weather is usually cloudy or overcast in the N half of the country but - under the influence of descending air on the S slopes of the mountains - much less cloudy near the S coast. In NE Iceland precipitation, falling mainly in the form of snow during the period November to April and sometimes in October and May as well, is abundant, compared with normal amounts in that area. It is interesting to note that, except in November and December, another, less extensive area of excess precipitation is found in the southwesternmost part of Iceland, but it seems likely that much of this precipitation is due to a few cases when a polar low developed off the SW coast or a new cyclone was approaching from the SW. In a belt which usually extends from the Breiðafjörður area to the SE coast the amounts of precipitation are usually below normal, with fairly large deficiencies in smaller areas of varying location.

Pressure and wind. The 500 mb maps show a deep low over the sea to the NW or N of Iceland. The area of mid-tropospheric cyclonic SW flow extends beyond Iceland and in most cases probably beyond (sometimes far beyond) the Faroes. At the surface, on the other hand, winds over the Iceland area are NE and the curvature of the streamlines generally anticyclonic. This implies that a considerable

thermal gradient exists across Iceland; according to the evidence provided by maps no 1 and 2, the lower half of the troposphere is a good deal colder (from November to March on an average 4 to 5° colder) at Hornbjargsviti than at Höfn. It may be gathered from the pressure tendencies that the surface high shown on maps ^{no} 2 is approaching Iceland or intensifying, or both, but it is not yet a vigorous high and is not necessarily developing into a blocking anticyclone.

The fact that ^{the} wind at 500 mb is usually SW does not prevent the NE winds near the surface of the earth from reaching gale force. On the contrary, the gale frequency (as defined) on days referred to type 226 is fairly high, 12.9%, and it is worth noting that 80% of all gales were from the NE quadrant, N and E inclusive. A few of these gales were widespread or severe, or both (see Supplement, item D). The rather windy character of this type in the coastal areas of Iceland may also be seen from maps no 3, according to which the "mean max. wind" values are as high as 33-37 knots at Vestmannaeyjar during the period November to February, and locally about 25 knots along the N coast from November to January. At some inland stations, Þórustaðir and Reykjahlíð in particular, the "mean max. wind" values are rather low, which may be due to some sheltering from the NE winds or to the relatively frequent formation of a local temperature inversion near the surface of the earth.

Temperature. According to the departures of the 500 mb relative topography from the respective monthly means, the mean temperature of the lower half of the troposphere is on an average about 4, in November and December 5-6° below normal on days referred to type 226. Generally speaking, the departures at the surface of the earth are not quite as large as that. They are largest, mostly between -4 and $-5\frac{1}{2}$ °, in November, and relatively small, -1 - -3° at most stations, in April, May and October. The smallest departures are consistently found in the coastal region of E and S Iceland; at Fagurhólsmýri, for instance, they vary from -1.1° in October and May to -3.3 in December. The largest departures are found not only - as with most other cold types - in the interior of NE Iceland (Grímsstaðir: -2.9 in April, -4.8 in March and -5.2 in November), but also in the far NW (Hornbjargsviti: -2.5° in October, -5.2 in November and -5.5 in March). This geographical distribution reflects the importance

of the preceding history of the air-masses involved: to NW Iceland the air may arrive after travelling a short distance only over the open sea, to SE Iceland the heating from below has been active during a much longer period, and the air arriving here may not always be of arctic origin.

According to maps ^{no}/5, the mean difference between daily max. and daily min. temperatures is generally 3-5° at the coastal stations and 5-7° (October and November: 4½ - 6°) at most stations in the interior. The largest values are usually found in the interior of E Iceland but occasionally farther W; they never exceed 7½°. The smallest differences are found in October (Stykkishólmur, Hornbjargsviti, Grímsey and Vestmannaeyjar: 3.0 - 3.1°).

Cloudiness. Throughout the eight months covered by the present investigation, type 226 is usually associated with cloudy or overcast weather in N Iceland, not only along the coast but also in the interior. The mean cloudiness for the 8-month period at Hornbjargsviti is as large as 7.4 oktas, at Raufarhöfn 7.2, at Akureyri 6.7, at Grímsstaðir 6.5 and as far south as Hveravellir 6.3 oktas. Farther W and S the effects of subsidence and foehn-like processes are more distinct, and the cloudiness figures are somewhat lower; at Reykjavík and in the coastal region of SE and S Iceland they are mostly within the range 5 - 5.5 oktas (Reykjavík 5.2, Vestmannaeyjar 5.4, Kirkjubæjarklaustur 4.9, Teigarhorn 5.2 oktas). Broadly speaking, the month-to-month variations are remarkably small, but it may be noted that the February value for Kirkjubæjarklaustur (based on observations on 16 days only) is as low as 3.6.

Precipitation. The arctic air invading Iceland from the NE has taken up heat and humidity during its travel over the open sea, and with the resulting moist-adiabatic lapse-rate (up to a height of 1-2 km at least) conditions are favourable for the formation of showers, sometimes also for the development of more extensive convective systems. The fact that the upper winds are southwesterly may presumably, together with the forced ascent of the air on the N or NE slopes of the mountainous parts of Iceland, further the development of minor circulation systems (with a horizontal axis) and thus the occurrence of intermittent precipitation in NE Iceland. The maps no 7 all show an area of relatively abundant

precipitation in NE Iceland, with monthly figures mainly within the range 200-300% in its core region (see table below).

Most of the monthly maps indicate the existence of another surplus area somewhere near the SW coast; the extent of this area is smaller and more variable, and it is not present on the maps for November or December.

Small or moderate deficiencies are usually found in a belt extending from W or NW Iceland (most frequently from the Breiðafjörður region) across the SW part of the interior highlands to the coast of SE Iceland; in November and December this area also comprises the whole of SW Iceland. The smallest amounts of precipitation with the area of deficiency are within the range 25-50% on most of the maps, but in a few instances one or two stations, mainly in W Iceland, receive less than 25% of the normal monthly amounts.

The following table illustrates the broad features of the precipitation regime in NE and extreme SW Iceland and in the "dry belt" described above.

Mean amount of precipitation per day (in mm and in % of normal amounts), type 226

	J	F	M	A	M	O	N	D
A:NE Iceland, mm	2.8	2.2	2.2	2.2	1.4	2.4	2.4	3.1
%	204	191	179	222	232	148	151	221
B:SW coast, mm	3.6	3.9	3.0	4.8	2.0	3.6	1.9	1.9
%	87	114	89	166	87	75	43	42
C:"Dry belt", mm	1.4	1.5	2.0	2.1	1.5	2.7	1.3	1.6
%	35	52	68	89	70	67	33	43

The following stations were selected to represent the areas A,B and C: for A, Grímsey, Akureyri, Reykjahlíð, Grímsstaðir and Raufarhöfn; for B, Vestmannaeyjar, Eyrarbakki and Keflavík; for C, Lambavatn, Stykkishólmur, Síðumúli, Fagurhólsmýri and Teigarhorn.

It may be noted that in March, April, May and October the "dry belt" receives about the same amount of precipitation as NE Iceland (but a much smaller proportion of the normal amount), whereas the contrast between this belt and the SW coast is rather small in October and November and negligible in December, as far as the relative amounts are concerned.

The precipitation in NE Iceland may readily be explained as caused ^{by} the lifting of moist and in the lower layers destabilized maritime air of arctic origin. As for the SW coast various mechanisms

may be imagined, e.g. a lingering of the arctic front just off the coast (with associated frontal convergence) or the occasional rapid development of a new low approaching Iceland from the SW.

The contrasts shown on the maps no 8 are smaller than those characteristic of most other types; generally speaking, the frequency of an amount of precipitation ≥ 1.0 mm is between 30 and 70% over at least two thirds of Iceland. Areas where the frequency is less than 30% (but not less than 10) are found on each of the 8 monthly maps, covering mainly parts of the "dry belt" described above; in January and May these areas are relatively large. On the other hand, on every map one or two coastal stations are shown to receive at least 1.0 mm on 70% or more of all days; on the map for March there are three such stations, widely apart: Hornbjargsviti, Dalatangi and Eyrarbakki. At the latter station, a surprisingly large amount (63 mm) was measured on 28 Feb. 1973, at a temperature a little above freezing and thus higher than that normally experienced with type 226.

Type 226 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. top.	515	516	517	519	525		527	515	513
Departure	-7	-8	-7	-9	-8		-8	-11	-10

B. Stations where the "mean_max_wind" is relatively
 high low

Vestmannaeyjar(8)	Þórustaðir(8)
Hveravellir (5/7)	Reykjahlíð(8)
Hornbjargsviti(5)	Hallormsst(6)
	Akureyri (5)


C. Frequency and direction of gales ("max. wind" \geq 30 knots). Sum of possible number of days with a gale:
 $23 \times 191 - 91 = 4302$
 Actual number of days with a gale:

$$555 = 12.9\%$$

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported on 9 occasions: 5 in January, 1 each in February and October, 2 in December. Two reports (both in January) came from Fagurhólsmýri, all others from Vestmannaeyjar. The wind direction was ENE-ESE (70-110°) except in two cases when Vestmannaeyjar had a velocity between 60 and 70 knots from NNE and W, respectively. The highest velocity reported on a day referred to type 226 was 77 knots (Vestmannaeyjar, 12 Dec. 1962: 110° 77 knots). On three successive days referred to this type, 12-14 Jan. 1975, the gales were particularly widespread and also rather severe.

Distribution as a direction:

40	72	110
7		220
14		43
12		18
4	1	14

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Fagurhólsmýri (8)	Hornbjargsv.(6)
Teigarhorn (8)	Grímsstaðir (5)
Dalatangi (8)	Akureyri (5)
Kirkjubæjarkl.(6)	
Vestmannaeyjar(5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Hornbjargsv.(8)	Kirkjub.kl.(8)
Raufarhöfn (8)	Reykjavík (8)
Grímsey (8)	Teigarhorn (7)
Akureyri (5)	Vestmanna.(7)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Raufarhöfn (8)	Lambavatn (8)
Grímsey (7)	Stykkishólmur(5)
Reykjahlíð (6)	
Grímsstaðir(5)	

H. Large daily amounts of precipitation (≥ 40.0 mm)

A daily amount of precipitation ≥ 40.0 mm was reported in the following three cases:

Eyrarbakki, 28 Feb. 1973:
63.3 mm;
Dalatangi, 28 Apr. 1972:
44.5 mm;
Dalatangi, 22 May 1960:
47.9 mm.

Type 234.

Number of cases month be month: 26,15,18,31,19;26,21,16.
The mean values and frequencies discussed below are probably fairly representative as far as January, April and October are concerned; for the remaining five months the representativeness is probably below average and may be poor in some cases.

Type 234 is characterized by a moderate or rather strong S flow of very mild maritime air over Iceland and the adjacent sea areas. The curvature of the flow at 500 mb is anticyclonic; at the surface of the earth a ridge usually exists near the S coast of Iceland, and a lee trough is found over N Iceland. The distribution of cloudiness and precipitation also illustrates the importance of topography: in the S of Iceland cloudy and rainy weather prevails, and large amounts of precipitation are quite common near the S coast; in the NE, weather is much less cloudy and precipitation sparse. The NW and the Snæfellsnes peninsulæ show, apart from local lee effects (e.g. at Hornbjargsviti), a similar type of weather as S Iceland, with frequent and often abundant rain; this may, in addition to topographical factors, be due to the proximity of this part of Iceland to frontal waves moving rapidly N or NNE over the Greenland sea.

Pressure and winds. The flow pattern shown by maps no 1, illustrating the topography of the 500 mb level, is a simple one: a strong ridge extends far northwards east of Iceland, and the curvature of the streamlines is anticyclonic as far west, at least, as the eastern part of the Greenland sea. Still farther west the contour lines tighten and become straighter, with a direction S - N or SSW - NNE, indicating the existence of a frontal zone at some distance W of Iceland. The source region of the air flowing N across Iceland is to be sought at low latitudes and the term "subtropical maritime air" may often be adequate. This is confirmed by the mean departures of the relative topography, which vary from appr. $+5^{\circ}$ in May and October to $+7-8^{\circ}$ in January and February.

The flow pattern at sea level (maps no 2) is similar to that at 500 mb in its broadest features but shows strikingly the effect of the mountains of Iceland: a ridge is seen on all monthly maps near the S coast, and a trough near the N coast.

This picture, based on mean values of the atmosphere pressure at ten Icelandic stations only, is necessarily over-simplified, even beyond the generalization resulting from the formation of mean values for a number of cases which (although referred to one and the same type) show some variation with respect to the direction and velocity of the basic flow. It may in fact be assumed that the mountains of Iceland - not only ridges forming an effective barrier to the flow but also, to some extent, isolated peaks - influence the flow pattern, and the pressure distribution, on an appropriate geographical scale and to a degree which depends, in a, on the velocity of the basic flow.

Maps no 3, showing the distribution of the "mean max. wind" velocity, confirm the picture obtained from maps no 2 as far as the concentration of isobars along the W part of the S coast is concerned: not only Vestmannaeyjar but also Keflavík and Reykjavík have "mean max. wind" values above 20 knots (except in May). The lowest mean max. values are not, as might have been expected, found in the interior of NE Iceland but at stations so widely apart as Teigarhorn, Háll and Lambavatn. Gale frequency (as defined), 11.4%, is close to its overall average value, with a highly asymmetrical distribution as far as the direction of the gales is concerned: 74% of all gales were from the sector 120-210° (S and SE), as against barely 1% from the opposite quadrant. Only a few of the gales were severe (see Supplement).

Temperature. Just as the other types (134 and 334) characterized by a strong S component of the geostrophic wind at 500 mb and a high level of the 500 mb surface over Iceland, type 234 is outstanding for high temperatures in the lower half of the troposphere; the departures of the 500 mb relative topography vary from $4\frac{1}{2}^{\circ}$ in May to $+7\frac{1}{2}^{\circ}$ in January and February. The vertical stability of the mild maritime air in lower layers is seen from the fact that the temperature departures at the surface, though mostly large, are not quite as large as those in the free atmosphere; in November and December they are hardly more than half as large.

The largest temperature departures at the surface are found

in February when they are generally within the range $+5-7^{\circ}$ but locally $+8-8\frac{1}{2}^{\circ}$ (Hallormsstaður $+ 8.4$); in November and December they are appr. $+3 - +4^{\circ}$ and in May $+2 - +4^{\circ}$. According to the maps no 4 the departures are, as might be expected, relatively small at the windward coasts and relatively large in those parts of N Iceland where foehn winds may be expected (Akureyri, Reykjahlíð) and at higher altitudes (Hveravellir). The differences found when comparing the departures from the monthly mean temperatures at respective stations are usually of the order of 3° ; in April the extremes are $+2.9$ at Vestmannaeyjar and $+6.6^{\circ}$ at Reykjahlíð. According to most of the monthly maps, the departures of Þórustaðir are relatively large. This is presumably not due to a local foehn, as the cloudiness figures (see map no 6) are high; a possible explanation is that the normal values for Þórustaðir, more than those of Lambavatn and Hornbjargsviti, are influenced by the fact that local ground inversions are often formed (with other types than 234) when the weather is calm and clear.

On the maps no 5 several examples may be found of what might be called a displacement of the isotherms caused by the wind: the areas of relatively large max.-min. differences are not found in the central part of Iceland but rather close to the N or E coast; in some cases even the coastal stations show quite high values, although the conditions for the formation of local inversions are usually less favourable there than farther inland. Low values of the max.-min. differences are found in S Iceland - particularly at some of the coastal stations but also farther inland - and in W Iceland as far ^{north} as the Breiðafjörður area. The following table may serve to illustrate the size of the difference month by month at some typical stations.

	J	F	M	A	M	O	N	D	Mean for 8 months
Hallormsstaður	<u>6.2</u>	5.3	<u>5.7</u>	<u>8.4</u>	<u>10.7</u>	6.9	<u>6.2</u>	<u>9.1</u>	<u>7.3</u>
Raufarhöfn	5.1	<u>5.9</u>	5.5	7.6	7.2	<u>7.2</u>	5.8	6.2	6.3
Vestmannaeyjar	2.3	3.4	2.6	2.2	2.6	2.2	2.2	3.6	2.7
Kirkjubæjarklaustur	3.5	4.4	3.7	4.9	5.1	3.1	3.2	4.2	4.0
Lambavatn	3.3	5.0	4.3	3.3	4.0	3.9	3.5	4.3	4.0

For each month the highest value of the table is underlined.

With few exceptions the values for Þórustaðir and Hornbjargsviti are 1-2° higher than those for Lambavatn, mainly because the latter station is much more exposed to the southerly winds prevailing on days referred to type 234.

Cloudiness. In the southern and western parts of Iceland type 234 generally brings cloudy or overcast weather ; mean cloudiness figures are as high as 7-7.5 oktas (for individual months in some cases even higher) at all coastal stations from Vestmannaeyjar to Þórustaðir, and at one inland station (Síðumúli) as well. Farther NE the clouds sometimes break up under the influence of foehn-like processes, but as the mean values still, with a few exceptions, are rather high, it seems that a veil of higher clouds (As, Ci and Cs) may often be present even on the ^{side of the} lee of mountains. The lowest monthly mean values, within the range 5-6 oktas, are found in NE Iceland, mainly but not exclusively at stations in the interior. The mean values for Reykjahlíð, Feb., and Hallormsstaður, May, are conspicuously low (3.5-4.0 oktas) but, considering the fewness of data on which they are based, probably not representative; the same applies to the May value for Hveravellir.

Precipitation. Large and consistent geographical contrasts are shown on the maps no 7 and 8. The normal wetness of S and W Iceland is accentuated, as well as the scarcity of precipitation which prevails in the NE. The regional differences are brought into focus by the following table:

Mean amount of precipitation per day (in mm and in % of the normal amounts), type 234.

	J	F	M	A	M	O	N	D	Mean for 8 months
(A) S Iceland, mm	5.2	10.2	10.3	5.5	3.0	17.0	11.6	10.9	9.2
" " , %	129	265	287	177	114	325	251	240	233
(B) W Iceland, mm	4.4	6.1	5.7	4.1	3.0	9.3	7.8	6.8	5.9
" " , %	150	236	224	221	175	256	224	220	216
(C) NE Iceland, mm	0.2	0.7	0.8	0.1	0.1	0.9	0.8	0.8	0.6
" " , %	7	32	48	8	10	36	28	26	24

The stations used for the computation of the mean values given in the table were, for (A): Kirkjubæjarklaustur, Vestmannaeyjar and Hæll; for (B): Keflavík, Stykkishólmur, Lambavatn; for (C): Grímsstaðir, Hallormsstaður, Dalatangi.

The month-to-month variations, as they appear in the table, are somewhat irregular and may not all be real. In particular, the values for January are probably too low, for S Iceland at least.

Among the details shown on maps no 7 the position of the boundary between the areas of surplus and deficiency of precipitation, and the steepness of the gradient in the vicinity of that boundary, are of special interest. It is apparent from the maps, that while Lambavatn is always relatively wet, Hornbjargsviti is definitely dry during the period March to May; the contrasts between Hlaðhamar and Hraun are mostly slight, but on February and March they are large; Dalatangi is definitely on the dry side, but Teigarhorn is much wetter in January, March, April, November and December and very wet in February and October. Here again, the month-to-month variations seem too irregular to be trusted.

The maps no 8 confirm the general picture obtained from maps no 7 without adding much to it. It may be noted that an area where the frequency of at least 1.0 mm of precipitation is less than 10% is found in NE Iceland on all maps except that for October, and covers the entire NE part of the country in May; conversely, the said frequency exceeds 70% in parts of W and S Iceland, except in May, and is as high as 90-95% locally in a few instances. The frequency of an amount exceeding 10 mm is exceptionally large, 50-60%, in ^{the} southernmost part of Iceland during October, and almost as high in parts of the same area during February, March, November and December. As mentioned in the Supplement, item H, large daily amounts of precipitation have often occurred on days referred to type 234, mainly at Kirkjubæjarklaustur and Fagurhólsmýri but occasionally at other stations, too, in S and W Iceland. Even amounts exceeding 100 mm have been measured at the two stations just mentioned.

Type 234, (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	537	539	536	541	542	546	539	537	536	539	537	537
Departure	+15	+15	+12	+13	+9	+11	+13	+14	+11	+13	+14	+14

B. Stations where the "mean_max.
wind" is relatively
high Low

Vestmannaeyjar(8) Teigarhorn (8)
Hveravellir (6/6) Hæll (8)
Reykjavík (8) Lambavatn (7)
Keflavík (8) Kirkjub.kl.(5)
Dalatangi (5) Þórustaðir (5)

C. Frequency and direction of
gales ("max. wind" \geq 30 knots).

Sum of possible number of
days with a gale:

$$23 \times 172 - 110 = 3846$$

Actual number of days with
a gale:

$$439 \approx 11.4\%$$

Distribution as to direction:

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was
reported once from Hveravellir
(wind direction: S) and three
times from Vestmannaeyjar (E
or ESE). One case occurred in

January, one in October and two
in December. The highest velo-
city reported was 90° 64 knots
(Vestmannaeyjar, 14 Dec. 1965).

No widespread gale was reported
on a day referred to this type.

2	.	.
33	□	4
6		21
28		63
41	115	156

- E. Stations which, according to the anomalies of monthly mean temperature, appear as
- | | warm | cold |
|-------------|-------|------------------|
| Akureyri | (7) | Vestmannaey. (6) |
| Reykjahlíð | (6) | Teigarhorn (5) |
| Hveravellir | (4/6) | |
- G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as
- | | large | small |
|--------------|-------|-----------------|
| Kirkjub.kl. | (8) | Dalatangi (8) |
| Lambavatn | (8) | Grímsstaðir (7) |
| Stykkish. | (6) | Hallormsst. (7) |
| Vestmannaey. | (5) | Akureyri (6) |
| Keflavík | (5) | Raufarhöfn (5) |
- F. Stations whose monthly means of cloudiness, compared with those of other stations, are
- | | high | low |
|--------------|------|-----------------|
| Lambavatn | (8) | Grímsstaðir (7) |
| Þórustaðir | (6) | Reykjahlíð (7) |
| Vestmannaey. | (6) | Hallormsst. (6) |
| Keflavík | (5) | Dalatangi (5) |
| Stykkish. | (5) | |
| Síðumúli | (5) | |
- H. Large daily amounts of precipitation (≥ 40.0 mm). A daily amount of precipitation ≥ 40.0 mm was measured on no less than 36 occasions. The number of days on which such amounts were reported from one or more stations were: Jan. 1, Feb. 2, March 3, April 1, May 1, Oct. 9, Nov. 2, Dec. 2.
- The stations involved were: kirkjubæjarklaustur (13 times), Fagurhólsmýri (10), Vestmannaeyjar (4), Teigarhorn (3), Þórustaðir (2), Hornbjargsviti, Hveravellir, Hæll and Keflavík (1 each). An amount ≥ 60.0 mm was reported in seven cases. The largest amounts occurred on 14 April 1962 when Fagurhólsmýri had 124.8 and Kirkjubæjarklaustur 111.3 mm. The latter station also had 94.9 mm on 17 Nov. 1968.

Type 235.

Number of cases month by month: 22,22,23,17,25;27,24,17.

The mean values and frequencies discussed below may be assumed to be fairly representative, except in the case of April and December when they may be rather poor from this point of view.

When type 235 prevails, the flow at 500 mb above Iceland is SSW, often rather strong; it is a definitely meridional type. At the surface the general direction of the flow is usually S or SSE, but the mountains of Iceland provoke a distortion clearly visible on the mean maps. Gales, mainly southeasterly or southerly, are rather frequent at exposed places along the coasts of Iceland. In spite of the warm-air advection indicated by the vertical wind shear, the cold air is usually advancing eastwards, if only slowly and intermittently. The temperature departures at the surface and in the free atmosphere are positive but not always large; their distribution indicates the approach of somewhat colder air from W or SW. The weather associated with type 235 is usually cloudy or overcast, and the amount of precipitation is above normal, except in NE Iceland where small or moderate deficiencies are prevalent.

Pressure and winds. The circulation type shown on maps no 1 is strongly meridional. With a well-established warm ridge to the east and an equally well-developed trough to the west, Iceland is situated near the middle of a broad SSW current. The curvature of the streamlines near Iceland is insignificant, a further evidence that the amplitude of the long (Rossby) wave is considerable. A frontal zone will usually be found between the ridge and the trough; minor waves may move rapidly NNE along this frontal zone.

At the surface the general flow is usually from the S or SSE, but the Icelandic highlands give rise to a marked distortion, with a rapid changes of direction and curvature along the streamlines; for a discussion of some problems which are relevant in this connection, see the text dealing with type 234.

The weather type is quite windy, as shown by maps no 3, with rather frequent SE or S gales on the exposed parts of the Icelandic coast; less frequently, gales from other directions may be caused by the rapid development of a wave disturbance in the vicinity of Iceland.

Temperature. The temperature departures are positive throughout, in the free atmosphere as well as at the surface. According to the anomalies of the relative topography, the average departure in the lower half of the troposphere varies from $+1^{\circ}$ in May to $+4$ in January. Compared with the temperature excess associated with type 234 (representing a more westerly position of the ridge), we may infer that a weak cold front may often have moved across Iceland, although the advancement of the much colder air to the west is slow and perhaps discontinuous. The geographical distribution shown by maps no 4 gives at least an indication that the air, broadly speaking, is colder near the W coast than in E Iceland.

On most of the monthly maps the departures are generally within the range $+1$ to $+3^{\circ}$; they are somewhat larger in January, and above all in February when several stations in the interior of E Iceland have an excess of appr. 6° .

The maps no 5 show, rather consistently, an area of relatively large max.-min. differences in NE Iceland. In this area the differences are of the order of 6° in February, March, October and November and as large as $7-8^{\circ}$, at some stations at least, in January, April, May and December. On the other hand, low values, generally about 4° , prevail in the S of Iceland and in the Faxaflói-Breiðafjörður area, the lowest monthly value being 2.9° at Vestmannaeyjar in October. In the northwestern peninsula the values for Þórustaðir and, excepting April and May, for Hornbjargsviti are relatively high, while those for Lambavatn are a good deal lower. These differences are no doubt real, as far as the stations are concerned, but the geographical scale on which they occur may be smaller than that indicated on the analyzed maps.

Cloudiness. The mean cloudiness on days referred to type 235 is very high for Iceland as a whole. For most of the stations used for the analysis, the 8-month average is between $6\frac{1}{2}$ and 7 oktas; for Hveravellir, Síðumúli, Stykkishólmur, Lambavatn and Þórustaðir they are slightly above 7 oktas. Relatively low values - but still hardly below the relevant climatological normals - are found at Reykjahlíð (5.7) and Grímsstaðir (5.8), presumably caused by the occasional dissolution of clouds in lee on the mountains.

The month-to-month variations of the mean amount of clouds are generally small. It is noteworthy that none of the stations has a mean cloudiness less than 6 oktas in May.

Precipitation. In the southern half of Iceland and in W Iceland as far north as the Breiðafjörður district type 235 is associated with frequent and abundant precipitation; along the N coast, the amounts are close to normal, and in the interior of NE Iceland small or moderate deficiencies prevail.

On the maps no 7 for February, March, April, May and December an area is shown where the amount of precipitation is more than three times the normal amount; the position and extent of this area varies, but the following stations receive more than 300% during two or three of the months concerned: Stykkishólmur, Reykjavík, Keflavík, Kirkjubæjarklaustur and Teigarhorn. Expressed in mm, the largest mean amounts per day referred to type 235 are 15.4 mm at Kirkjubæjarklaustur in February and 16.4 mm at Fagurhólsmýri in December; these amounts are among the largest on record for any station, type and month, Expressed in % of the corresponding normals, the largest value is that for April in Stykkishólmur (7.5 mm or appr. 470% of the normal amount). It is remarkable that in December the relatively largest excess is found as far N as Hlaðhamar (4.3 mm/day, to be compared with a normal value of 1.4 mm). Large and irregular, presumably not fully representative month-to-month variations are found mainly in E Iceland: Hallormsstaður receives about twice the normal amount in February and March but only about half the normal amount in January, April and May, while at Dalatangi March is very wet and February dry.

Within the dry area, the largest deficiencies are found in May, when Grímsey, Raufarhöfn and Hallormsstaður receive about 30% of the normal amount, and in December when the corresponding figure (probably not fully representative) for Reykjahlíð is even lower.

It follows from the above comments that large geographical contrasts exist, e.g. in April, May and December. On the other hand the contrasts shown by the maps for October are surprisingly small: no station received less than 50 or more than 185% of the amount normal for that month.

The maps no 8 show the dryness of the interior of NE Iceland as well as the wetness of S and SW Iceland in a striking and consistent manner. An area where the frequency of an amount of precipitation ≥ 1.0 mm is less than 30% is found on all monthly maps; the extent of that area varies, but its position is rather permanent: at Grímsstaðir, the said frequency is less than 30% during all months concerned. On the other hand, an area where 1.0 mm or more is measured on 90% of all days is also shown on all monthly maps; it is small in March and December but remarkably large in February. A frequency of 100% of days with 1.0 mm or more is found for a few types, stations and months only but occurs here on the maps for February (Fagurhólsmýri and Kirkjubæjarklaustur) and April (Vestmannaeyjar). It may also be mentioned that in December, no less than 11 out of a total of 17 days had at least 10.0 mm of precipitation at Fagurhólsmýri. As for the occurrence of large daily amounts, see the account given in the Supplement (item H).

Type 235 (Supplement).

(10-199)

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	530	531	531	533	535					539	533	529
Departure	+8	+7	+7	+5	+2					+4	+7	+6

B. Stations where the "mean max. wind" is relatively high low

Vestmannaeyjar(8)	Pórustaðir (8)
Hveravellir (7/7)	Teigarhorn (8)
Fagurhólsmýri (6)	Hæll (6)
Reykjavík (6)	Kirkjub.kl.(5)
	Reykjahlið (5)

C. Frequency and direction of gales ("max. wind" ≥ 30 knots). Sum of possible number of days with a gale: 23 x 177 - 112 = 3959
Actual number of days with a gale:

534 = 13.5%

Distribution as to direction:

	10	11	10
7			61
18			55
52			53
34	101	122	

D. Severe gales (≥ 60 knots).

A wind velocity ≥ 60 knots was reported from one station only, Vestmannaeyjar, but in no less than nine cases (Jan. 4, Feb. 1, Dec. 4). The direction was 90-110° in five cases, 180-200° in three and 270° in one case. In two cases the velocity exceeded 70 knots: on 1 Jan. 1964 (110° 76 knots) and on 14 Dec. 1977 (200° 76 knots). No particularly widespread gale occurred on a day referred to type 235.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Grímsstaðir(8)	Hornbjargsv.(8)
Reykjahlíð (7)	Stykkish. (7)
Hallormsst.(6)	Hraun (6)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Síðumúli (8)	Reykjahlíð (7)
Stykkish. (7)	Grímsstaðir(7)
Lambavatn (6)	Hallormsst.(6)
	Dalatangi (5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Kirkjub.kl.(6)	Grímsstaðir(7)
Reykjavík (6)	Akureyri (7)
Hæll (6)	Reykjahlíð (5)
	Hallormsst.(5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount of precipitation ≥ 40.0 mm was reported on 12 occasions: 3 in Jan. (one day only), 3 in March (two days), 2 in May, 3 in Oct. and 1 in Dec. The stations involved were: Fagurhólsmýri (5 days), Kirkjubæjarklaustur (3 days), Síðumúli, Þórustaðir, Dalatangi and Teigarhorn. An amount exceeding 60 mm was measured on 5 Jan. 1966 at three stations, among which Teigarhorn reported 70.2 mm.

Number of cases month by month; 17,16,21,16,20;20,17,27. These figures, except the one for December, are rather low, and it must be concluded that some of the mean values and frequencies discussed below may not be representative.

At the 500 mb level a deep cyclone - in some cases perhaps the main cyclonic vortex of the northern hemisphere - is located west of Iceland, presumably over the Greenland Sea or southern Greenland. The corresponding surface low is usually found off the coast of SW Iceland, but a secondary low is indicated on some monthly maps near the N coast. Gales are frequent, and the various directions are more evenly represented than with almost any other type, which indicates that the main cyclone or an intense secondary depression may be centred now here, now there in the vicinity of Iceland. After the passage of one or more cold fronts moving NE across Iceland, temperatures are near the seasonal average; the departures computed from the limited amount of data were mainly between -2 and $+1^{\circ}$. The cloudiness amount is mostly below normal in the eastern third of the country but otherwise large. As for precipitation, a surplus is found almost everywhere; large areas receive 150-250% of the normal amount. Areas of deficient precipitation are regularly found in the NE part of the interior, and on some of the monthly maps in other parts of N Iceland, too. Except for these limited areas the frequency of precipitation (1.0 mm at least) is mostly high or very high.

Pressure and winds. The 500 mb maps for the various months all show the existence of a deep trough to the W of Iceland. On some of the maps (for May, November and December) the curvature of the contour lines seems to indicate, if not prove, the existence of a closed vortex at the 500 mb level in this area; on other maps the curvature is less marked and the impression obtained is that of a major trough over or near Greenland. The interpretation of the surface maps is more complicated. The existence of a low - often a deep low and probably often the main surface low associated with the upper trough mentioned above - off the SW coast of Iceland is well substantiated,

but in addition some maps show a trough over N Iceland or a secondary low near the N coast. The latter features may reflect the influence of the topography of Iceland on the general S flow, but moreover it seems possible that the occasional rapid development of a secondary low on the eastern flank of the main trough may have caused a distortion of the character just mentioned. The irregular pressure tendencies - positive on most maps but negative in some part of Iceland on others, and in one case (February) showing a large isallobaric gradient - point to the fact that the mean values for type 236 are based on relatively few data and hence must be taken with some reservation.

The disturbed character of the weather associated with type 236 is clearly expressed in the figures for "mean max. wind", which are generally above average (even at Grímsey and Raufarhöfn where the gradient on most of the mean pressure maps is small), and in the gale frequency. The overall frequency of gale (as defined) is 15.1%, among the highest frequencies obtained for any type.

In the gale statistics for type 236 the various wind directions are more evenly distributed than in the case of almost any other type; the frequency of easterly gales (i.e. from the 90°-sector 45-135°) is 29%, southerly 25, westerly 28 and northerly 18%. Details regarding severe and widespread gales on days referred to type 236 are given in the Supplement.

Temperature. From the surface maps, and perhaps even more from the 500 mb maps, one might get the impression that 236 should be a rather mild type. However, the maps no 4 do not confirm such an assumption. Only during January are all temperature departures positive; in December all are negative. Both positive and negative departures occur in the remaining six months, but only in February and October is the area showing an excess larger than that showing a deficiency. The largest positive departures, $1\frac{1}{2}$ - 2°, are found in the easternmost part of Iceland in February and October, while relatively large negative departures, -2 - -3°, are found in the NW peninsula in March and practically everywhere in W Iceland in December.

It is a common feature of all monthly maps except that for January that the temperature is lower, compared with respective normals, in W Iceland than farther E. This fact gives the clue to the problem indicated above: the occurrence (in most months) and dominance (in some months) of negative departures must be due to an advection of polar air, probably originating in the Labrador-Baffin Bay area, on an cyclonically curved track; obviously, the chances that the heating of this air over the open sea may lead to positive temperature departures is larger in the E part of Iceland than in the W part. - On all monthly maps the departure for Hornbjargsviti is lower than for any ^{other} station; the explanation might be that occasionally cold air from Greenland is drawn into ^{the} circulation of a secondary low, centered, as indicated in the previous section, off the N or NE coast of Iceland.

The maps no 5 require only few comments. The largest max.-min. differences are generally found in central Iceland or in the interior part ^{of} E Iceland; they amount to 6 or 7° on most of the monthly maps, ^{but} locally (Hallormsstaður) to as much as $8\frac{1}{2}^{\circ}$ in March, presumably a radiation effect. The lowest values, $3\frac{1}{2} - 4\frac{1}{2}^{\circ}$, are found at coastal stations in SW Iceland (Vestmannaeyjar in particular), in the Breiðafjörður district and - in January and April - at Grímsey.

Cloudiness. The cloudiness figures for type 236 are, as for the two previous types (234 and 235), above the climatologically normal values, except in the interior of NE Iceland, but they are, generally speaking, not quite as high - mostly within the range $6 - 6\frac{1}{2}$ oktas. The month-to-month variations are somewhat irregular but mostly small; monthly mean values below $5\frac{1}{2}$ oktas are found in E Iceland, locally in most months but over a large area in November. The slight decrease in mean cloudiness with this type when compared with the less cyclonic types 234 and 235 is probably due to the fact that the maritime polar air invading Iceland from a southerly direction is less humid and less stable than most other air masses arriving from that direction.

Precipitation. Many different mechanisms for precipitation may be of importance on days referred to type 236: frontal precipitation associated with a cold front on which waves may form, orographic precipitation (mainly in S Iceland), drizzle in relatively mild maritime air (mainly in E Iceland), and showers or convective systems forming in unstable maritime polar air (mainly in W and SW Iceland). The combined effect of these processes is seen on maps no 7. All monthly maps show a large area with a moderate or large excess of precipitation and a much smaller area with a usually small deficiency. The largest amounts, when compared with climatological normals, are not, as with most other types, confined to just one or two parts of the country; they may be found in the interior of E Iceland (Hallormsstaður 400% in February and April), at various coastal stations in S, SW and W Iceland (January, May, October, November) and, rather unexpectedly, as far NE as Grímsey and Raufarhöfn (these stations both had between 200 and 250% in December). Three stations - Þórustaðir, Akureyri and Reykjahlíð - have received less than the normal amounts in three months out of eight, and Grímsstaðir in six months out of eight, but the lowest figure (Reykjahlíð, May, 33%) is not particularly low. On five of the monthly maps (those for February, March, April, October and November) only one or two of the stations used for the present investigation have received less than the normal amount for the station and month concerned.

The picture obtained from maps no 8 are in this case more consistent than that obtained from maps no 7. An area of relatively low precipitation frequency - usually less than 30% of all days receiving 1.0 mm or more - is always found in the interior of NE Iceland, and an area of high frequency (usually 70-90%) comprises, broadly speaking, most of S Iceland and usually a part of NW Iceland too. The frequencies shown on the map for October are exceptionally high: most stations in the southern half of Iceland had at least 1.0 mm of rain on all days referred to type 236, and at Fagurhólsmýri and Kirkjubæjarklaustur as many as 70% of all October days had at least 10.0 mm. The number of cases in which really large amounts, 40 mm or more, were measured was, however, not particularly large (see Supplement, item H).

Type 236 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	A	S	O	N	D
Rel. top.	524	525	520	524	530	535	525	522	535	525	522
Departure	+2	+1	-4	-4	-3	0	-1	-1	0	-1	-1

B. Stations where the "mean maximum wind" is relatively high low

Vestmannaeyjar (8)	Þórustaðir (8)
Hveravellir (7/7)	Hæll (7)
Grímsey (6)	Lambavatn (5)
Reykjavík (5)	Reykjahlíð (5)

C. Frequency and direction of gales ("max. wind" \geq 30 knots).
Sum of possible number of days with a gale:

$$23 \times 154 - 96 = 3446$$

Actual number of days with a gale:

$$498 = 14.5\%$$

Distribution as to direction:

	37	25	27
18	18	82	82
31	31	39	39
88	88	25	25
48	48	35	43

D. Severe gales (\geq 60 knots).
A wind velocity \geq 60 knots was reported from Teigarhorn in one case, Fagurhólsmýri in one and Vestmannaeyjar in 9 cases. The months in which this occurred were: January (2 days), February (1), March (3), May, October, November and December (1 each). The wind directions were rather varied: 70-110° in 6 cases, 140 in one, 230 in one, 270 in one and 320-340° in two cases. The highest velocity was reported from Vestmannaeyjar: 320° 76 knots on 14 Feb. 1959. Widespread gales occurred on three days referred to type 236: 24 Oct. 1963, 22 Jan. and 16 Feb. 1975.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Dalatangi (8)	Hornbj.v. (8)
Teigarhorn (8)	Þórustaðir(7)
Hallormsst.(7)	Stykkish. (5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear

- in comparison with corresponding figures for other

stations - as

large	small
Reykjavík (5)	Grímsstaðir (7)
Hæll (5)	Akureyri (5)
	Þórustaðir (5)
	Hornbjargsv.(5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Þórustaðir (7)	Hallormsst.(7)
Stykkishólmur (6)	Teigarhorn (7)
Hornbjargsviti(6)	Dalatangi (7)
Lambavatn (6)	Kirkjub.kl.(6)
Síðumúli (6)	Reykjahlíð (6)
	Grímsstaðir(5)

H. Large daily amounts of precipitation (≥ 40.0 mm). A daily amount

of precipitation ≥ 40.0 mm was reported on 6 occasions: 1 in

February, 2 in April, 2 in October and 1 in December. The

stations involved were:

Hallormsstaður (1), Fagurhólmsmýri (2), Kirkjubæjarklaustur (2) and Hveravellir (1). The largest amount reported was 53.3 mm at Fagurhólmsmýri on 2 April 1967.

Type 314.

Number of cases month by month: 39,19,28,22,15;20,34,37. According to these figures, the representativeness of the mean values and frequencies discussed below is probably good for January, November and December, rather good for March, less good but probably acceptable in February, April and October and poor in May.

Type 314 is characterized by a fairly strong westerly flow, with a northerly component, at the 500 mb level. At the earth's surface a high or, according to some monthly maps, a ridge over or near S Iceland is moving E or SE, following this upper flow. Gales are relatively infrequent. The average temperature of the lower half of the troposphere is well above normal. At the surface the temperature departures are less uniform: they are mainly positive from February to May, mainly negative in October and November, while in December and January positive departures prevail in W and negative departures in E Iceland. The weather is usually rather cloudy in the west and less cloudy in the east; the average amount (taking all stations together) is much less in May than during the period November to April. In accordance with the anticyclonic character of this type, the amount of precipitation is usually small in the central and southeastern parts of Iceland, but from December to April areas with a small or moderate excess are found in other parts of the country, mainly in W Iceland.

Pressure and winds. The maps no 1, showing the mean flow at the 500 mb level, are all very similar: they show a well-developed, but relatively flat ridge extending northwards to the west of Iceland. The 500 mb winds over Iceland are thus west-northwesterly and moderately strong. A frontal zone may be assumed to lie N of Iceland; the air flowing across Iceland is moderately warm, with mean departures in the lower half of the troposphere varying from $+1\frac{1}{2}^{\circ}$ in October to $+4$ in April (see Supplement, item A); it may be of polar or subtropical origin but has been modified in both cases by travelling across a large part of the Atlantic ocean.

The surface maps (no 2) are less uniform and less readily interpreted. They show, however, either a closed high or a ridge of high pressure somewhere over or near southern Iceland. This is obviously a moving high or ridge, and it seems probable that in most cases a surface front associated with the frontal zone mentioned above is to be found south of this high if a closed circulation is present. The 12-hours pressure tendencies indicate - rather clearly on the maps for February, November and December - that the weather in Iceland is about to change into a more cyclonic type, initiated by the approach of a developing low or trough over the Greenland sea.

The overall frequency (for all stations and months) of gales for type 314 is 8.8%, well below the average value for all types combined. About 30% of these gales were westerly or westsouth-westerly (sector 225 to 285°); the other directions were fairly equally represented. Most of the gales in W and N Iceland were probably associated with the rapid development of a wave disturbance moving E a little N of Iceland; in S Iceland, however, a number of E gales occurred, which may have been associated with a relatively strong low-level high over Iceland or the rapid deepening of a low approaching from the southern part of the Greenland sea.

Temperature. As mentioned above, the average temperature of the lower half of the troposphere is well above normal, the mean departures varying from $+1\frac{1}{2}^{\circ}$ in October to $+4^{\circ}$ in April. In this case, too, the picture obtained from the surface observations is different and more complicated. The departures are mainly positive ($0 - +2^{\circ}$) in February, April and May, mainly negative ($0 - -2^{\circ}$ in most cases) from October to January, and mainly between $-1\frac{1}{2}$ and $+1\frac{1}{2}^{\circ}$ in March. At least seven of the eight monthly maps, however, have one feature in common: it is relatively mild in W, relatively cold in E Iceland, as shown by the following table.

	Mean temperature departure, type 314.									Mean for 8 months
	J	F	M	A	M	O	N	D		
A:W Iceland	+0.1	+1.2	+1.3	+1.4	+1.1	-0.3	-0.2	+0.5		+0.6
B:E Iceland	-1.9	0.0	-1.1	-0.5	+0.7	-2.0	-2.4	-1.4		-1.1
Diff. (A-B)	+2.0	+1.2	+2.4	+1.9	+0.4	+1.7	+2.2	+1.9		+1.7

The stations selected for the purpose of obtaining mean values were, for A: Reykjavík, Stykkishólmur, Þórustaðir, Hlaðhamar and Eyrarbakki; for B: Grímsstaðir, Hallormsstaður, Teigarhorn and Fagurhólsmýri.

As the table shows, the geographical differences concerned are between 1 and $2\frac{1}{2}^{\circ}$, except in May when they are quite small. Although the figures for May may not be representative, it seems likely that at this time of the year the air mass invading Iceland from the W may sometimes be heated from below, whereas during the other seven months dealt with in the present investigation a cooling normally takes place.

According to maps no 5 the max.-min. differences are rather large. They are, as usual, larger in the interior than in most coastal areas. In the interior of E Iceland they are generally between 7 and 10° (Hallormsstaður, May: 11.2); at a few more or less sheltered locations in W Iceland some of the monthly values may be equally high (Þórustaðir, Dec.: 8.1; Síðumúli, May: 9.8; Eyrarbakki, Nov.: 8.4). The smallest differences are mostly found at Vestmannaeyjar, where they vary from 3.1° in April to 6.1 in November. In May, and to some extent in March, April and October, the relative large differences found mainly in the interior reflect the significance of radiative processes; in the winter months they depend on the frequency and magnitude of temperature changes associated with frontal passages, with increasing or decreasing wind velocity, and with increasing or decreasing cloud amount. It is worth mentioning that the max.-min. differences in November and December are almost as large as those in May; there may be a connection between this circumstance and the relatively large pressure tendencies shown on maps no 2 for November and December.

Cloudiness. It may be assumed that stratiform clouds are normally present in the air invading Iceland from the W when type 314 prevails. Above this cloud cover, the subsidence often associated with an anticyclonic flow pattern may have led to a considerable decrease in relative humidity. If so, the conditions are favourable for a partial dissolution of the clouds over Iceland itself, under the influence of topographical features and, during the late spring in particular, of heating caused by incoming radiation.

The following table illustrates the effect of these processes.

	J	F	M	A	M	O	N	D	Mean for 8 months
(A)W Iceland	62	68	70	69	52	64	70	70	66
(B)E Iceland	52	60	55	60	46	47	56	58	54
Diff. (A-B)	10	8	15	9	6	17	14	12	12

The figures of the table also show that in most cases the mean cloudiness is between $5\frac{1}{2}$ and 7 oktas, but the figures for May, and in E Iceland for October, are conspicuously low. As far as May is concerned, it should be remembered that the mean values are based on a small number of cases (only 15).

Precipitation. As might be expected in the case of a type characterized by an anticyclonic upper flow with a northerly component and (in most cases) by a surface high centred near Iceland, type 314 is essentially a dry type. All monthly maps show the existence of an area where the amount of precipitation is between 10 and 25% of the normal amount. The position of this area, as well as its extent, varies somewhat from month to month. In most cases it includes a considerable portion of E and SE Iceland (the 8-month averages for Hallormsstaður and Teigarhorn are as low as 18 and 13%, respectively), but in May and October it also comprises more than half of northern Iceland; however, the representativeness of the data for these months, and more particularly for May, is questionable.

Areas receiving more than 100% of the normal amount of precipitation are found, mainly in the western third of Iceland and sometimes in the Grímsey-Raufarhöfn area, on all monthly maps except those for May, October and November. In most cases the excess is small and limited to a few stations. In March, however, most of W Iceland and a smaller area in the NE receive more than 100% and a few stations (Lambavatn, Hlaðhamar and Síðumúli) more than 200% of the normal amount; in December the picture conveyed by maps no 7 is rather similar but the areas and the surplus amounts are somewhat less. The relatively large amounts thus obtained in parts of W Iceland may perhaps be caused by the approach of a low from the Greenland sea, as indicated by the pressure tendencies, but it should be observed that no area of excess precipitation is found on the map for November where these

tendencies are particularly large. The surplus area found in NE Iceland, mainly in March and December, probably indicates that occasionally a minor low moves E or SE across this part of the country, followed by N winds.

The contrast between E and W Iceland shown by maps no 7 is confirmed by the maps illustrating precipitation frequency. An area where less than 10% of all days receive as much as 1.0 mm is found on all monthly maps, according to the analysis; in several cases the supporting evidence is weak, but in May the area is seen to comprise all of N Iceland and the central highlands, while in October the frequency of an amount ≥ 1.0 mm is less than 10% in a belt extending from the Skagafjörður district to the coast of SE Iceland. On the other hand, the said frequency exceeds 50% at a few stations (mainly in W Iceland) in February, March and December, and is close to 50% at some stations in January, October and November. It may be noted that in March as many as 14 out of 28 days gave at least 5.0 mm precipitation in Lambavatn.

In the Supplement, item H, a few cases are mentioned when a daily amount ≥ 40.0 mm was measured on a day referred to type 314.

Type 314 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	528	529	531	536	539	542	545	548	551	554	557	560
Departure	+6	+5	+7	+8	+6	+3	+2	+1	+1	+3	+5	+6

B. Stations where the "mean max. wind" is relatively high

	low
Vestmannaeyjar (8)	Hæll (8)
Hveravellir (5/5)	Lambavatn (8)
Grímsey (7)	Hallormsst. (7)
Fagurhólmur (5)	Þórustaðir (7)
Keflavík (5)	Teigarhorn (5)

C. Frequency and direction of gales ("max. wind" \geq 30 knots).

Sum of possible number of days with a gale:

$$23 \times 214 - 104 = 4818$$

Actual number of days with a gale:

$$422 = 8.8\%$$

Distribution as to direction:

	24	23	15
46			39
52			23
76			28
	25	44	27

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported from Vestmannaeyjar in three cases (2 in January, 1 in February) and from Hornbjargsviti in two (1 in April, 1 in November).

The direction was in the case of Vestmannaeyjar 20° (once) or 90° (twice), in the case of Hornbjargsviti 180-200°.

The highest velocity was recorded at Vestmannaeyjar on 4 Jan. 1965 (90° 66 knots). No particularly widespread gale occurred on a day referred to type 314.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Þórustaðir(7)	Raufarhöfn (8)
Keflavík (6)	Teigarhorn (8)
	Dalatangi (7)
	Hallormsst.(6)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Lambavatn(7)	Teigarhorn (7)
Hlaðhamar(6)	Fagurhólm.(7)
Síðumúli (5)	Kirkjub.kl.(6)
Reykjavík(5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Grimsey (7)	Hallormsst.(8)
Lambavatn (6)	Teigarhorn (7)
Hornbjargsv.(6)	Reykjahlið (7)
Keflavík (5)	Grímsstaðir(6)
	Kirkjub.kl.(5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount of precipitation ≥ 40.0 mm was reported on three occasions only:

- Vestmannaeyjar, 26 Jan.1964:60.8 mm
- " 10 Feb.1969:40.2 "
- Þórustaðir , 33 Dec.1975:40.3 "

Number of cases month by month: 14,24,23,18,28; 31,27,29. The numbers for January and April are probably too small to give representative mean values and frequencies. For the remaining six months the representativeness may be assumed to be either fair or good.

On the 500 mb maps Iceland appears to be about halfway between a deep low over the Jan Mayen-Spitsbergen area and an anticyclone, presumably of the warm type, over the mid-Atlantic. In the lower layers of the troposphere a cold anticyclone, usually over W or N Iceland or over the adjacent sea, is moving fairly rapidly ESE, following the mid-tropospheric flow. Easterly gales may occur at the S coast of Iceland; in other parts of the country the travelling high generally, if only briefly, brings light or moderate variable winds. Temperatures are below average everywhere; in the interior and in the NE Type 315 is usually accompanied by severe, but not necessarily persistent cold. The mean amount of cloudiness varies considerably from one station or month to another; broadly speaking the weather is rather cloudy at the northernmost stations and less cloudy in SE Iceland. The amounts of precipitation are generally small or moderate, but minor areas showing an excess are found in NE Iceland; at Raufarhöfn two months show a large excess, presumably due to the advection of arctic air which has been destabilized while travelling across the northern part of the Greenland sea. The largest deficiencies of precipitation are found in SE Iceland; near the east coast large contrasts exist between stations which are not far apart.

Pressure and winds. The 500 mb maps for the various months are all rather similar. A deep low, in some cases probably the main cyclonic vortex of the northern hemisphere, is centred somewhere in the area Jan Mayen-Spitsbergen, and a well-developed high at a similar or perhaps greater distance in the opposite direction. This implies that the mid-tropospheric flow over and near Iceland is westnorthwesterly and fairly straight. The gradient varies a little from month to month, being strong in February and December and little more than half as strong in May.

It is not self-evident that the surface maps corresponding to these upper-air maps should show or at least suggest a closed anticyclone over or near Iceland, but that is what most of the

maps no 2 do. On the maps for February, November and December the centre of the surface high is over Iceland itself, on those for January, March, April and October the curvature of the isobars suggest its position to be near the NW peninsula; only the map for May gives the impression that the centre of the high may be found at a greater distance to the NW. It is obvious that this must be a travelling high, and on some of the monthly maps (that for December in particular) the pressure tendencies suggest a rather rapid displacement toward E or ESE.

On the SE and S coast of Iceland the gradient, in spite of the proximity of the high, is rather strong on most of the monthly maps, and the corresponding "mean max. wind" values for the coastal stations from Dalatangi to Reykjanes are fairly high. It is a little more surprising that moderately high mean max. wind values are found (excepting May) at the northernmost stations also; it seems likely, however, that this is due, partly at least, to rapidly increasing W or SW winds as the anticyclone moves away towards ESE. The general impression obtained is that the light or moderate winds associated in a large part of Iceland with the travelling high may soon give way to a more disturbed weather type, with winds approaching gale force in some cases. For the 24-hour period concerned, however, the frequency of gales (10.5% as defined) is a little below average. The most frequent directions of the gales observed are ENE and E ($45-105^\circ$): 29% together, followed by NNW and N ($315-15^\circ$): 23%, and SE ($105-165^\circ$): 17%, but even WSW and W gales ($235-285^\circ$) are not unusual: 12%. A limited number of these gales were severe, but none was particularly widespread (see Supplement, item D).

Temperature. In the lower half of the troposphere the mean temperature on days referred to type 315 is several degrees below normal; the average departure is $-2\frac{1}{2}^\circ$ in May and $-4 - 5\frac{1}{2}^\circ$ in the months October to April.

As shown by the maps no 4 the departures at the earth's surface are of about the same size in October, November, February and April but somewhat larger in December, January, March and May. Their month-to-month variations are irregular, even in the case of March to April when the values might be assumed to be representative. As for the location of the largest and the smallest departures the consistency is much better: in the interior of NE Iceland

the departures are 50-100% larger than at the coastal stations of W and SW Iceland, as shown by the following table:

Mean temperature departure, type 315.

	J	F	M	A	M	O	N	D	Mean for 8 months
(A) Coastal stations of W and SW Iceland	-3.8	-2.4	-4.4	-2.5	-2.2	-2.1	-3.9	-4.8	-3.3
(B) Interior of NE Iceland	-7.4	-5.0	-7.6	-5.3	-4.9	-4.1	-6.8	-7.1	-6.0
Diff. (A-B)	3.6	2.6	3.2	2.8	2.7	2.0	2.9	2.3	2.8

The stations selected to represent respective areas were, for A: Lambavatn, Stykkishólmur, Reykjavík, Keflavík and Vestmannaeyjar; for B: Akureyri, Reykjahlíð, Grímsstaðir and Hallormsstaður.

The main causes for the difference between areas (A) and (B) are probably the larger cooling experienced in (A) during intervals of clear and calm weather and the abrupt rise in temperature in area (B) associated with increasing winds from a southerly direction as the Icelandic high recedes towards ESE.

Evidence of the rapid changes in the synoptic situation which are often associated with type 315 is given by maps no 5. All monthly maps except that for October show an area in the interior of Iceland where the average value of the max.-min. difference exceeds 8° ; in February this difference is $9-11^{\circ}$ at almost all inland stations and 11.4° at Hallormsstaður, one of the largest values obtained by this difference during a winter month at any station and for any type. At the coastal stations, too, the max.-min. differences are generally larger than for most other types; during the period November to April they are mostly within the range $5\frac{1}{2} - 7^{\circ}$ even at highly exposed coastal stations. (February: Dalatangi $7,0$, Hornbjargsviti 7.2 ; December: Vestmannaeyjar 6.8)

Cloudiness. The mean amount of cloudiness for the country as a whole is roughly within the interval $5\frac{1}{2} - 6\frac{1}{2}$ oktas, i.e. close to the climatologically normal values. As might be expected, the weather is more cloudy in most coastal areas - particularly at the N coast - than in the interior; the 8-month average for Grímsey is 6.8 , for Hallormsstaður 4.9 oktas. It may be remarked that Teigarhorn, although situated at the coast, has a very low average value (4.7 oktas), an indication that with type 315 the winds are usually blowing off-shore at this station. The month-to-month variations shown by the sequence of maps no 5 are rather considerable but irregular and probably not fully representative; the values

for February and October are relatively high, those for January, April and May relatively low. As for February, the large amount of clouds might seem incompatible with the large max.-min. differences mentioned above, but in the present case these differences are definitely not to be interpreted as an evidence of large diurnal amplitudes of the type found on clear and calm days.

Precipitation. In most of Iceland type 315 is a moderately dry type, with amounts of precipitation mostly within the range 30-70% of the normal amounts. The largest deficiencies are found at Hallormsstaður (8-month average: 19% of normal) and in the coastal area of SE Iceland from Teigarhorn to Kirkjubæjarklaustur (Fagurhólsmýri, 8-month average: 24% of normal); in this part of the country the influence of the moving high lasts a little longer than in W and N Iceland. On all monthly maps a relatively small area with above-normal precipitation is found in NE Iceland; the excess is small or rather small, except in March and December, when Raufarhöfn receives $2\frac{1}{2}$ - 3 times the normal amount on days referred to type 315. The excess found in this part of the country is probably due to the advection of arctic air which has been heated from below and become saturated with humidity while moving across the open sea north of Iceland.

The transition in E Iceland from the area of relatively abundant to that of very scanty precipitation is quite abrupt, as far as the percentage values are concerned; in December, for instance, Grímsstaðir receives twice the normal amount and Hallormsstaður only 10%. If the amounts as such are compared, without being referred to respective normal values, the contrast is rather less striking, but still the 8-month sum of daily precipitation associated with type 315 is more than twice as large at Grímsstaðir as it is at Hallormsstaður.

The month-to-month variations shown by maps no 7 are somewhat irregular but, broadly speaking, less than for most other types.

As for precipitation frequencies, the maps no 8 all show a large area where the frequency of an amount ≥ 1.0 mm is less than 30%. This area comprises almost the whole of Iceland in May, and all except the northern third in October. On some of the maps the said frequency is less than 10% at a few stations. On the other hand, 50-80% of all days receive 1.0 mm or more at Raufarhöfn in all months except May (the May value is as low as 7%), at Hornbjargs-

viti during February, March and October to December, and at Grimsey and Dalatangi in November and December.

Large amounts of precipitation are quite uncommon with this type (see Supplement, item H).

Type 315 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. top.	513	515	515	520	528		527	515	516
Departure	-9	-9	-9	-8	-5		-8	-11	-7

B. Stations where the "mean max. wind" is relatively
high
low

Vestmannaeyjar (8)	Þórustaðir (8)	
Hveravellir (7)	Reykjahlíð (7)	
Raufarhöfn (7)	Hallormsst. (6)	
Keflavík (6)	Hæll (5)	
Grímsey (5)	Hlaðhamar (5)	

C. Frequency and direction of gales ("max. wind" \geq 30 knots).

Sum of possible number of days with a gale:

$$23 \times 194 - 72 = 4390$$

Actual number of days with a gale:

$$463 = 10.5\%$$

Distribution as to direction:

	44	61	31
12			72
22			64
32			50
14	31	30	

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported on one occasion from Síðumúli (4 Jan. 1975: SSE, 68 knots) and five times from Vestmannaeyjar. At the latter station one case occurred in January, three in March and one in April, and the wind directions were E-ESE (three cases), WSW (one case) and N (one case: 360° 78 knots on 2 March 1965). Widespread gales occurred on one day referred to type 315, namely 6 Feb. 1970.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Vestmanna. (8)	Grímsstaðir (8)
Keflavík (7)	Hallormsst. (8)
Lambavatn (6)	Reykjahlíð (7)
Reykjavík (6)	Raufarhöfn (7)
	Akureyri (6)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Grímsey (8)	Teigarhorn (8)
Raufarhöfn (7)	Hallormsst. (8)
Hornbjargsv. (5)	Kirkjub.kl. (5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Grímsstaðir (8)	Teigarhorn (8)
Reykjahlíð (8)	Hallormsst. (7)
Raufarhöfn (7)	Fagurhólm. (5)
Grímsey (6)	Kirkjub.kl. (5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount of precipitation ≥ 40.0 mm was reported in one case only: 41.1 mm at Þórustaðir on 4 April 1977.

Number of cases month by month: 19, 16, 15, 20, 23; 20, 15, 8.
With only one exception (May) these numbers are rather small, and it must be assumed that the representativeness of the mean values and frequencies discussed below are relatively poor in most cases. This applies in particular to the December values. The low frequencies indicate that the combination of a strong westerly mid-tropospheric flow with a northerly component and a 500 mb-height well below its average value is rather unusual during the period November to March.

The 500 mb maps show the existence of a deep or very deep cyclone in the area between Iceland and Jan Mayen. Arctic air from NE Greenland and the polar basin has been drawn into the circulation of this high-reaching cyclone and may have invaded Iceland a couple of days ago, but the surface wind is still northerly - very often a northerly gale -, and the cold-air advection continues. A surface high is approaching Iceland from NW or W and may be intensifying at the same time. The temperature is very low, both at the surface and in the free atmosphere. On the N coast of Iceland the weather is cloudy or overcast, but most of the monthly maps indicate that the amount of clouds has already decreased when the air reaches the interior of N Iceland; in S Iceland - and in those parts of W and E Iceland where foehn processes may be expected on days with strong N winds - the amount of cloud is usually small and often very small. The precipitation maps also show great contrasts. In NE Iceland the amounts - falling almost exclusively as snow during the whole period October to May - are well above normal; the excess at Raufarhöfn is large, from December to April very large indeed. In other parts of the country, in SE and S Iceland above all, the amounts are usually deficient and in some areas very scanty during several months.

Pressure and winds. The deep low which on all maps no 1 appears to be centred somewhere between Iceland and Jan Mayen is probably in most cases the end product of a cyclogenesis in the North Atlantic, the low having moved NE and later N or NW across the Norwegian sea. A large volume of arctic air from NE Greenland and adjacent ice-filled sea areas has been drawn into the circulation of this cyclone, and the outbreak may have reached Iceland two or

three days before the day dealt with here, but the advection of cold air continues, as seen by comparing the flow directions at the surface and the 500 mb-level. The northerly wind may still have the character of a gale in E Iceland and along the S coast but has usually decreased in NW Iceland, under the influence of a surface high approaching from W or NW. The pressure tendencies shown on maps no 2 are almost exclusively positive and often rather large (on the map for February they are very large in E Iceland), an indication that the high may also be intensifying.

If the "mean max. wind" values plotted on maps no 3 are compared with those for other types, it is seen that they are high in the eastern part of Iceland. At Teigarhorn, in particular, no other type gives equally high "mean max. wind" values as those pertaining to type 316, culminating in 30 knots for March. The winds are also rather strong in SW Iceland; in the NW they are moderate, as mentioned above.

The gale frequency (as defined) for type 316 is high, 15.0%. In accordance with the pressure distribution at the surface, most of the gales were from a northerly direction - as many as 65% were from the ^{90°} sector 315°-45°. A few cases of severe gales are recorded in the Supplement, item D.

Temperature. In the lower half of the troposphere no other type is colder than 316, as shown by the values of the relative topography in the Supplement. The monthly mean values all correspond to a temperature deficiency of 7° or more, culminating with about -10° in December and January.

The temperature departures of the surface are very large, mostly -8 to -10°, in December and March, but otherwise they are generally less than the mean departures of the lower troposphere, an indication that the cold air is relatively instable; if a ground inversion has formed, it is usually rather weak. The smallest departures, -4 to -6° in most of Iceland, are found in October, February and May. The large month-to-month variations expressed by the figures above, including the striking contrast between February and March, are hardly representative; the true mean departure for all months from November to March is probably between -6 and -9° in most of Iceland.

In spite of the relatively small number of days referred to type 316, the picture conveyed by the maps no 4 of the geographical

distribution of the departures is highly consistent. The largest departures are found in the interior of NE Iceland, and the smallest at the coastal stations of SW and S Iceland, from Stykkishólmur to Fagurhólsmýri. One station outside the latter area, namely Hraun, also has rather small departures; for a possible explanation of this, see the text dealing with type 216.

The month-to-month variations shown by maps no 5 (mean difference between daily max. and daily min. temperature) are mostly rather small. This applies both to the amount of the said differences and to their geographical distribution. The largest differences, which are found in the interior (and in some cases at Eyrarbakki), are of the order of 8° in most cases (11.4° at Hveravellir in December is based on 5 days only); the smallest differences, in the range between 4 and 6° , are found mainly at Grímsey but in a few cases at Stykkishólmur.

Cloudiness. Taking all stations together, the monthly mean values of the cloudiness are within the narrow range $5\frac{1}{2}$ - 6 oktas except for March when the mean is appr. 5 oktas. The geographical variations, on the other hand, are considerable. The 8-month mean values for Grímsey and Raufarhöfn are as high as 7 oktas, while the values for Teigarhorn, Kirkjubæjarklaustur and Vestmannaeyjar are within the range 4 - $4\frac{1}{2}$ oktas. At a few stations (Reykjavík and Vestmannaeyjar) the March values are particularly low, slightly less than 3 oktas.

It is not surprising that the clouds break up to a large extent when the arctic air moves south across Iceland, but it is a little more intriguing that this process seems to start while the air is still, broadly speaking, moving upslope over the northern part of the country. The mean values for Reykjahlíð are consistently 1-2 oktas lower than those for Grímsey, except in April and May. A possible explanation is that the turbulence caused by the broken topography of N Iceland is often sufficient to convert the low stratiform clouds formed over the Arctic sea into a less continuous layer, probably of Sc-type: occasionally, by way of provoking a mixing with much drier air above the humid surface layer, the turbulence might even lead to a complete dissolution of the clouds concerned.

Precipitation. The arctic air invading Iceland from the N when type 316 prevails is too cold to contain much water vapour, even when saturated (as it often is) in a shallow layer near the surface. However, the available moisture often condenses and falls out in the form of snow either near (and off) the coast or, under the influence of forced lifting, as the air moves upslope over northern Iceland. It is worth noting that by far the largest amounts of precipitation are measured at Raufarhöfn, followed by Grímsey and Dalatangi; in Akureyri as well as at Reykjahlíð and Grímsstaðir the absolute amounts are less, even if the surplus expressed in % of the normal amounts is much larger than at Dalatangi. In the following table the absolute and relative amounts of daily precipitation, month by month, are tabulated for the stations just mentioned and, for the sake of comparison, for Hallormsstaður and Teigarhorn which are on the dry side.

Mean daily amounts of precipitation (mm and %), type 316.

		J	F	M	A	M	O	N	D	Mean for 8 months
Grímsey,	mm	3.9	4.1	3.2	4.1	1.4	2.8	3.4	3.8	3.3
"	%	205	178	133	273	156	133	155	200	176
Raufarhöfn,	mm	5.5	6.5	5.3	4.0	1.8	3.9	4.5	6.2	4.7
"	%	344	591	589	444	257	170	281	413	356
Dalatangi,	mm	1.8	3.3	2.1	2.8	1.8	2.8	4.1	3.6	2.8
"	%	45	110	72	85	67	61	82	71	73
Akureyri,	mm	1.5	1.1	1.6	0.9	0.6	1.2	2.3	2.6	1.5
"	%	100	73	114	82	120	67	153	153	107
Reykjahlíð,	mm	1.3	2.0	1.9	1.4	1.1	1.4	2.5	3.1	1.8
"	%	130	222	238	175	183	100	227	258	188
Grímsstaðir,	mm	1.6	1.5	2.2	1.5	1.2	1.4	1.4	1.2	1.5
"	%	200	167	367	214	300	140	175	150	200
Hallormsst,	mm	0.6	0.4	0.6	1.5	0.3	0.1	0.3	2.2	0.8
"	%	16	17	40	136	33	5	11	67	34
Teigarhorn,	mm	1.0	0.6	0.5	1.1	0.9	0.4	2.5	0.7	1.0
"	%	22	18	16	41	38	9	60	15	26

Outside the area discussed above, the amounts of precipitation are below normal almost everywhere. A few exceptions occur, however, in NW Iceland and on the Reykjanes peninsula. An area where the precipitation is less than 25% of the normal amount is found in SE Iceland on all monthly maps except those for April and May, and sometimes extends westwards to SW Iceland; in a few cases another such area is found farther north in the western half

of the country. Several of the details shown on the monthly maps may, for reasons stated above, not be representative.

The same limitation is valid as regards maps no 8, but the following features, which are common to all or nearly all of these maps, may be considered as real:

An area of relatively large precipitation frequency (1.0 mm or more on about 70% of all days) is found in the coastal area of NE Iceland; in the northernmost part of W Iceland the frequency is somewhat lower but still rather high (except in May). Low frequencies prevail in the southern half of Iceland but there is a tendency that the values are somewhat higher in the far SW than in a belt extending from the central ^{part} of W Iceland to SE Iceland.

Type 316 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	503	508	507	513	519					520	512	503
Departure	-19	-16	-17	-15	-14					-15	-14	-20

B. Stations where the "mean max. wind" is relatively

	high	low
Vestmannaeyjar (8)		Þórustaðir (8)
Raufarhöfn (8)		Reykjahlið (8)
Hveravellir (5)	Hæll (7)	
Grímsey (5)	Lambavatn (6)	
Reykjavík (5)		

C. Frequency and direction of gales ("max. wind" ≥ 30 knots).

Sum of possible number of days with a gale:

$$23 \times 136 - 67 = 3061$$

Actual number of days with a gale:

$$458 = 15.0\%$$

Distribution as to direction:

	91	153	55
19			58
15			16
11			15
	8	4	13

D. Severe gales (≥ 60 knots).

A wind velocity ≥ 60 knots was reported once from Hveravellir (31 March 1966: 320° 64 knots), once from Teigarhorn (26 March 1970: 360° 68 knots) and on five occasions (one in each of the months January, February, March, May and November) from Vestmannaeyjar; the directions at the latter station were: 270° (one case) and 320-360° (four cases). The highest velocity occurred on 7 Nov. 1971: 340° 72 knots. None of the severe gales was particularly widespread.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm		cold	
Keflavík	(7)	Grímsstaðir	(8)
Hraun	(6)	Reykjahlíð	(8)
Fagurhólm.	(5)	Hallormsst.	(6)
Stykkish.	(5)	Hveravellir	(5)
Reykjavík	(5)	Síðumúli	(5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high		low	
Raufarhöfn	(8)	Kirkjub.kl.	(8)
Grímsey	(7)	Vestmanna.	(8)
Hraun	(6)	Teigarhorn	(7)
		Eyrbakki	(5)
		Lambavatn	(5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large		small	
Raufarhöfn	(8)	Kirkjub.kl.	(6)
Grímsstaðir	(8)	Teigarhorn	(6)
Reykjahlíð	(8)	Fagurhólm.	(6)
Grímsey	(8)	Hæll	(5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount of precipitation ≥ 40.0 mm was reported in one case only: norrbjargsviti, 16 Feb. 1962: 48.8 mm.

Type 324.

Number of days month by month: 12, 25, 25, 28, 33; 27, 25, 20.
The number of days for January is probably too small to give representative mean values and frequencies, and the same may be true in the case of December. For the six remaining months it may be assumed that the representativeness is good or at least acceptable.

Type 324 is characterized by a fairly strong westerly flow, with an anticyclonic curvature, at the 500 mb level. Lighter winds prevail at the surface, mainly from SW or W, but at the SW coast often between S and E; together with markedly negative pressure tendencies this may be taken as an indication that a developing low may be approaching Iceland from the southern part of the Greenland sea. From October to March the gale frequency is fairly high, with gales mainly from the sector SE to W; quieter conditions are prevalent in April and May. 324 is a mild type but not excessively mild; the departures are larger in the interior than in the coastal areas. The weather is usually overcast in the west of Iceland, and mean cloudiness is also high along the N and S coast, but in some parts of E Iceland it is relatively low. The amount of precipitation also shows a marked decrease from W to E: the contrast between the wettest areas near the W coast and the driest areas near the E coast is very large, except in May when the amount is deficient almost everywhere.

Pressure and winds. The 500 mb maps for all months show an anticyclonically curved, strong or moderately strong westerly flow over the Icelandic area; the various months differ mainly with respect to the strength of the gradient, which is almost twice as large in December as in May.

The surface maps are less similar to each other. Most of them show a high off the SE coast and a low to the N or W of the NW peninsula; this description is adequate as regards the maps for February, March and October to December, but in January two lows appear to be present, one off NE Iceland and another off the W coast, and in April and May the pressure distribution is rather flat with a weak trough extending from W to E across northern Iceland. The pressure tendencies are negative almost without exception, and rather large in February, October and November; together with S or SE winds near the SW coast (indicated on all maps except those for April and May) the pressure falls probably

heralds the approach of a developing low from the southern part of the Greenland sea.

The "mean max" winds are generally above average; here again April and May form an exception. The overall gale frequency is 14.%, which is fairly high; it varies from less than 3% in May to more than 25% in December, but more than half of this large difference may be ^{cf}a "climatological" nature (present for all types combined). The gales are mainly from a direction between SE and W; within that sector the distribution is fairly even (105-165°: 17%, 165-225°: 24%, 225-285°: 35%). A number of severe or widespread gales occurred on days referred to type 324 (see Supplement, item D).

Temperature. In the lower half of the troposphere 324 is a very mild type, with mean departures - according to the values of the 500 mb relative topography - varying from 4° in April to 6½° in November. The departures at the earth's surface are also positive (with one microscopic exception: Raufarhöfn, Dec.: -0.1°), but they are smaller, mostly within the range +1½° - +3½°; the largest departures, between 3 and 5° almost everywhere, are found in February and March, and the smallest (mostly less than 2°) in December.

The geographical distribution of the departures, as shown by maps no 4, is well-defined and very nearly the same from one month to another: the departures are 1-2° larger in the interior than along the north coast. This implies, in other words, that the normal temperature gradient between coast and inland is less than usual, which agrees with the cloudy character of the weather (see next section).

The max.-min. differences shown on maps no 5 are generally rather large in the interior and at some coastal stations as well. Some of the largest values, on the map for January in particular (Hallormsstaður: 10.1, Hornbjargsviti: 9.6, Grímsey and Teigarhorn: 9.4, Dalatangi: 9.2), are surprisingly high and may not be representative. It goes without saying that they tell nothing about the size of the systematic diurnal amplitude (which is negligible in January); rather, they represent the effect of temperature changes caused by variations in cloudiness and wind conditions

or by frontal passages. (In the case of Hornbjargsviti, even the effect of changes in cloudiness can almost be ruled out, as the mean cloudiness for each of the four observation hours concerned was 7-8 oktas.)

Cloudiness. The mean cloudiness figures for type 324 are very high: on an average $7\frac{1}{2}$ oktas in January, $6\frac{1}{2}$ in February, 6 in May and 7 in the remaining five months. At one third of those stations for which mean values are available, the mean for January was 7.8-8 oktas, which is not surpassed any month by any other type; the stations concerned are all in the northwestern half of Iceland. Relatively low values, less than 6 oktas, are found, mainly in February and May, in E Iceland.

The large amount of clouds associated with type 324 is readily explained by the fact ^{that} humid and thermodynamically stable maritime air is advected from the ocean to the S and W of Iceland. In many cases Ns-clouds with a large horizontal and vertical extent may invade W Iceland ahead of a warm front or ~~an~~ intensifying frontal wave; in other cases the clouds will be mainly low or medium clouds of a stratiform type ^{but} still of sufficient vertical extent to remain coherent over western, central and northeastern Iceland.

Precipitation. The eight monthly maps showing the amount of precipitation, expressed in % of the normal amount, all have one feature in common: an area with a large deficiency is found in E Iceland. Another feature is common to all maps except that for May: one or two areas, large or small, in W Iceland receive more than twice the normal amount. The great contrast between E and W Iceland is illuminated by the following table.

Mean daily amount of precipitation (in mm and in % of the normal amount), type 324.

	J	F	M	A	M	O	N	D	Mean for 8 months
A(E Iceland), mm	0.7	0.5	0.6	0.9	0.2	1.3	1.4	1.4	0.9
" %	19	18	22	39	10	35	37	34	28
B(W Iceland), mm	7.9	5.0	5.7	3.8	1.2	7.0	7.0	9.3	5.9
" %	308	184	261	216	87	205	230	354	238
B(mm) : A(mm)	11.3	10.0	9.8	4.2	5.9	5.3	5.0	6.7	6.7

The following stations were selected to represent the areas (A) and (B): for (A), Reykjahlíð, Hallormsstaður, Dalatangi, Teigarhorn and Fagurhólsmýri; for (B), Þórustaðir, Lambavatn, Hlaðhamar, Síðumúli and Hæll. For the purpose of obtaining the quotient B:A, A-and B-values with two decimals were used.

Not all areas in W Iceland exhibit an equally large surplus as the belt extending southeastwards from the NW peninsula to Rangarvallasýslu represented by (B). In Reykjavík, for instance, only five out of eight months receive more than the normal amount, and the net surplus is only 48%.

On maps no 8 the analysis, showing the frequency of a daily amount of precipitation ≥ 1.0 mm, confirms the large contrast between E and W Iceland. An area where the frequency concerned is less than 10% is found on all monthly maps except those for November and December, although the supporting evidence is weak as far as April and October are concerned; in May this area comprises the greater part of E Iceland. On the other hand, an area - in some cases more than one - where the frequency of a daily amount ≥ 1.0 mm exceeds 75% is found somewhere in W Iceland on all maps except those for April and May.

The large frequency of an amount ≥ 10.0 mm in some cases is remarkable. At all stations in the NW peninsula, at Eyrarbakki and at Vestmannaeyjar this frequency exceeds 30% during at least two of the months October to March. At Þórustaðir, four out of 25 March days referred to type 324 had more than 40 mm of precipitation; for further details concerning large daily amounts, see Supplement, item H.

Type 324 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. top.	534	536	536	536	542		544	539	534
Departure	+12	+12	+12	+8	+9		+9	+13	+11

B. Stations where the "mean max. wind" is relatively high low

Vestmannaeyjar (8)	Þórustaðir (8)
Hveravellir (5/5)	Lambavatn (7)
Fagurhólmur (5)	Teigarhorn (7)
Keflavík (5)	Hæll (6)
	Kirkjub. kl. (6)

C. Frequency and direction of gales ("max. wind \geq 30 knots).

Sum of possible number of days with a gale:

$$23 \times 195 - 117 = 4368$$

Actual number of days with a gale:

$$635 = 14.5\%$$

Distribution as to direction:

	22	12	10
31			44
63			28
162			53
60	94	56	

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported in 12 cases: 3 in January, 4 in February, 3 in October and 2 in December. The stations implied were Vestmannaeyjar (9 cases), Hveravellir (2 cases) and Hornbjargsviti (1 case).

The twelve cases are evenly distributed on three sectors, as far as wind directions are concerned: 4 cases from 90-110°, 4 from 140-180° and 4 from 230-250°. In two cases the velocity of an E gale at Vestmannaeyjar exceeded 70 knots: on 13 Jan. 1976 (110° 78 knots) and on 2 Oct. 1969 (90° 79 knots). Two widespread gales occurred on days referred to type 324: on 21 Oct. 1964 and on 28 Feb. 1970.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Hveravellir(5/5)	Raufarhöfn (7)
Reykjahlíð (6)	Grímsey (7)
Eyrarbakki (6)	Hornbjargsv.(6)
Síðumúli (6)	Teigarhorn (5)
Akureyri (5)	Dalatangi (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Lambavatn (7)	Teigarhorn (8)
Síðumúli (6)	Grímsstaðir(8)
Reykjavík (5)	Hallormsst.(7)
Eyrarbakki(5)	Dalatangi (6)
	Reykjahlíð (5)
	Kirkjub.kl.(5)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Síðumúli (8)	Dalatangi (8)
Lambavatn(7)	Teigarhorn (8)
Hlaðhamar(6)	Hallormsst.(8)
Hæll (6)	

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount ≥ 40.0 mm was reported on 12 days referred to type 324 - in two cases from two and in one case from three stations simultaneously. The stations were all in the western half of Iceland: Hornbjargsviti (1 case), Þórustaðir (6), Lambavatn (1), Síðumúli (1), Reykjavík (1), Eyrarbakki (2) and Vestmannaeyjar (3 cases). An amount ≥ 50.0 mm was reported from Þórustaðir in no less than five cases but not from any other station among those used for the present investigation. Three of the five cases were: 2 Jan. 1971 (94.7 mm), 8 March 1964 (73.8 mm) and 8 March 1971 (68.9 mm).

Type 325.

Number of cases month by month: 19, 10, 20, 19, 25; 22, 14, 21.

The number of cases for February is too small to give representative mean values and frequencies, and the same probably applies to the number of cases for November. As for the remaining six months, the representativeness may perhaps be assumed to be acceptable.

As far as the 500 mb level is concerned, type 325 is characterized by a moderate or strong, usually rather straight, W or WSW flow in the Icelandic area. The surface maps for the various months are strikingly different, with a prevalence of E, often strong, winds at the coast of SW Iceland as the only common feature. Although the direction of the wind is variable and the gradient on the maps showing monthly mean pressure is generally weak, the "mean max. winds" are mostly above average, and so is the gale frequency; the distribution of the gales with respect to their direction is remarkably uniform. Temperature departures are mainly in the interval -1 to -3° in November and December and otherwise mostly between -1 and $+1$; it is generally relatively cold at the N coast, relatively mild in SW Iceland. The weather is usually cloudy or overcast, although - according to mean values based on too few data - November seems to be an exception. The amount of precipitation is, broadly speaking, above normal in W Iceland and below normal in SE Iceland; the month-to-month variations with respect to the extent and position of the areas of excess and deficiency, and also as regards the largest deviations in both directions, are considerable but several of these variations may not be representative.

Pressure and winds. As shown by maps no 1, the 500 mb flow is westerly or westsouthwesterly over the Icelandic area and usually rather straight; an anticyclonic curvature is indicated on the maps for March and May. The gradient varies according to the season: it is almost twice as large in February as in May. (The February value, however, may not be representative.)

The pressure distribution at the earth's surface, as shown by maps no 2, is surprisingly different from month to month. In most cases, however, a weak high or a weak ridge of high pressure is shown either over SE Iceland or off the SE coast, a low off SW Iceland and either another low off the NE coast or a weak trough (in February even, relatively well-developed low) in the vicinity

of the N coast. Considering the few days on which two of the monthly maps are based, it may be assumed that some of the more conspicuous month-to-month variations would have disappeared if a much longer series of observations had been used.

As the gradient on the maps no 2 is generally small, except perhaps near the coast of SW Iceland, it might have been expected that the "mean max. winds" shown on maps no 3 would be rather low. On the contrary, they are, by and large, above the all-type average values. The explanation may be that many different surface pressure fields are possible with type 325; hence, the gradients shown on maps no 2 are vector means of gradients which vary considerably with respect to direction. The "mean max. wind", which represents the scalar mean, may thus be quite large even in an area where the gradient is zero or very small.

The largest "mean max. winds" are, as always, found at Vestmannaeyjar; for the whole period November to April they are very high, 39-45 knots. Some of the monthly values for other stations may also seem remarkable, but they are probably less representative.

The gale frequency as defined, 15.0%, is surpassed by a few other types only. As shown by the figures in the Supplement, item C, the various directions are fairly evenly represented; for 90°-quadrants the relative frequencies are, for E, S, W and N respectively: 38, 25, 20 and 17%. The rather high frequency for E gales might have been substantially reduced if the observations at Vestmannaeyjar had been made at a location less exposed than Stórhöfði. For details regarding severe and widespread gales, see Supplement, item D.

Temperature. As might be expected for a type characterized by normal values of the meridional wind component and of the height of the 500 mb surface, the temperature departures shown by maps no 3 are not large. It might perhaps also be anticipated - as the maps nos 1 and 2 together indicate a fairly large thermal gradient directed towards north - that the positive departures would be found mainly in the southern, the negative ones mainly in the northern part of the country. The month-to-month variations, on the other hand, could hardly be anticipated;

they are rather large and probably not fully representative.

On the maps for January to April and that for October the boundary between positive and negative departures extends in a W-E direction across Iceland. In January the area of negative departures is large, and the value for Grímsey is -2.4° . In February and March the zero line goes through N Iceland, but the negative departures north of that line are not much smaller than the positive departures to the south of it; the contrast between ^{the} February values for Hornbjargsviti (-2.5) and Vestmannaeyjar ($+3.5$) is unusual but may not be fully representative. In April and October the areas of positive and negative departures are of approximately equal size.

In May, November and December no departures are positive. The limits are roughly: 0 to $-1\frac{1}{2}^\circ$ in May, $-\frac{1}{2}$ and -2 in November, -1 and -4° in December. In the two latter months the largest negative departures are not found at the N coast but in ^{the} interior of NE Iceland.

All maps no 5 show an area of relatively large max., -min. differences over the interior of E Iceland. The largest differences are mostly $8-9^\circ$, but in October only $6-7$; in January, the value for Reykjahlíð is 10° (mean max. -1 , mean min. -11°). At a majority of the coastal stations the difference is between $4\frac{1}{2}$ and $6\frac{1}{2}$; the smallest difference is always found at Vestmannaeyjar (October: 3.1), the largest at Þórustaðir (February: 7.9), Raufarhöfn (March: 7.9) or Teigarhorn (November: 6.8). The small difference at Vestmannaeyjar reflects the high frequency of strong winds at that station, whereas the high values at the other coastal stations mentioned above may be due to a shift from offshore to onshore winds or vice versa.

Cloudiness. The weather associated with type 325 is usually cloudy or overcast; for most months the mean values for the cloudiness is within ^{the} interval $6\frac{1}{2} - 7\frac{1}{2}$ oktas in most of W Iceland, and in February and March even higher in some areas. November is a striking exception insofar as all stations in W Iceland except Keflavík and Hornbjargsviti have a rather low mean value ($5\frac{1}{2} - 6$ oktas), but as the November values are based on too few days they are probably not representative.

In E Iceland the weather is usually less cloudy than farther W, but most monthly mean values are still within the interval $5\frac{1}{2}$ - $6\frac{1}{2}$ oktas, at Grímsey and Raufarhöfn $6\frac{1}{2}$ - $7\frac{1}{2}$ oktas. Values as low as $4\frac{1}{2}$ - 5 oktas are found in November and December only, and mainly at Kirkjubæjarklaustur, Teigarhorn and Dalatangi.

The generally cloudy weather fits in with the advection of humid maritime air indicated by maps nos 1 and 2. The somewhat lower values in parts of E and SE Iceland are probably due to a temporary effect of a low-level anticyclone centred near the SE coast.

Precipitation. In their broadest features, most of the monthly maps of precipitation (in % of the normal amounts) show an area of excess covering most of W Iceland and an area of deficiency which comprises the greater part of SE Iceland. By closer inspection several complications are found, even beyond the rather capricious and probably not quite representative month-to-month variations. The more important complications may be seen from the following table.

Mean daily amounts of precipitation (in mm and in % of the normal amounts), type 325.

	J	F	M	A	M	O	N	D	Mean for 8 months.
Area A, mm	2.6	4.8	3.6	1.8	1.6	4.8	4.0	2.6	3.2
" , %	80	155	141	92	108	129	109	78	112
" B, mm	3.4	8.6	3.0	2.2	1.6	4.4	3.6	3.1	3.8
" , %	129	336	126	114	111	128	115	117	148
" C, mm	1.9	5.0	1.9	1.1	0.9	2.4	1.7	1.4	2.1
" , %	109	308	114	84	122	109	98	86	129
" D, mm	1.1	3.2	1.2	1.0	0.6	1.6	1.3	1.3	1.4
" , %	28	111	47	42	30	43	32	29	44

The areas may be termed as follows, A: westernmost Iceland (represented by Þórustaðir, Lambavatn, Stykkishólmur and Keflavík), B: area of max. precipitation (Hornbjargsviti, Hlaðhamar, Síðumúli, Hæll), C: north coast E of Húnaflói (Hraun, Grímsey, Raufarhöfn), D: area of min. precipitation (Hallormsstaður, Dalatangi, Teigarhorn). A, B and C all have an excess of precipitation as far as the 8-month values are concerned, and most of the monthly values are within the interval 85-130% of normal,

but in February the excess in areas B and C is very large. Even in area D February shows an excess, but all other months concerned here receive between 25 and 50% only of the appropriate normal amounts.

The 8-month mean values show that the total surplus is somewhat larger in area B than in A and C, and also that D, which normally has more precipitation than C, now receives only two thirds of the amounts falling in that area.

The reason why B has more precipitation than A may be that the release of precipitation caused by topographical factors, although starting near the coast-line, is not fully effective until further inland. As for the difference between C and D, the sheltering by Vatnajökull and other mountainous regions and the temporary effect of a weak surface high may both be of importance.

The maps no 8 all show an area in E Iceland where the frequency of a daily amount ≥ 1.0 mm is relatively low, and one or more areas in S or W Iceland where it is relatively high. The absolute level of the said frequency varies, however, considerably from month to month, according to the evidence given by those partly insufficient data on which the maps are based. In E Iceland, for instance, several monthly maps show a fairly large area where the frequency is less than 30%, and inside that area perhaps a small area where it is less than 10%, but on the maps for February (based on 10 days only) not more than one station, Reykjahlíð, has a frequency of ≥ 1.0 mm which is less than 50%. In S and W Iceland May has relatively few days with precipitation (1.0 mm or more on less than half of all days, except at Kirkjubæjarklaustur), while a large area has a very high frequency, 90-100%, of such days in the month of February.

Type 325 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. top.	522	529	526	527	534		532	527	520
Departure.	0	+5	+2	-1	+1		-3	+1	-3

B. Stations where the "mean max. wind" is relatively
high low

Vestmannaeyjar (8)	Pórustaðir (8)
Hveravellir (8)	Hæll (7)
Fagurhólsmyri (7)	Teigarhorn (6)
Keflavík (7)	Hallormsst. (5)
Grímsey (6)	

C. Frequency and direction of gales ("max. wind" \geq 30 knots).

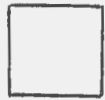
Sum of possible number of days with a gale:

$$23 \times 150 - 68 = 3382$$

Actual number of days with a gale:

$$507 = 15.0\%$$

Distribution as to direction:

40	26	20
19		84
40		60
43		49
26	41	59

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was

reported on 16 days (Jan.:5,

Feb.:1, March:2, April:1, May:

1, Oct.:2 (from two stations

in one case), Nov.:1, Dec.:3).

The stations implied were Vest-

mannaeyjar (12 cases) and -

each in one case only - Lamba-

vatn, Hveravellir, Grímsey,

Teigarhorn and Fagurhólsmyri.

The wind direction was E or ESE (75-115°) in 12 cases; other directions were SE, W, N, NNE and NE (one case each). The

velocity exceeded 70 knots in one case only (Vestmannaeyjar,

20 Dec. 1977: 90° 73 knots). Widespread gales occurred on

two days, none of which is included among the 16 days with

severe gales: 9 Feb. 1965 and 10 March 1972.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Eyrarbakki (7)	Hornbjargsv.(8)
Keflavík (7)	Raufarhöfn (8)
Reykjavík (6)	Grímsey (6)
Hveravelli (5)	
Hæll (5)	

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Hornbjargsv.(7)	Teigarhorn (8)
Grímsey (6)	Grímsstaðir(8)
Hveravellir (5)	Hallormsst.(7)
Keflavík (5)	Dalatangi (6)
Stykkish. (5)	

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Hlaðhamar(8)	Dalatangi (8)
	Teigarhorn (8)
	Hallormsst.(7)
	Fagurhólsm.(5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

Among the stations selected for the present investigation, only three cases occurred, all of them in October:

9 Oct.1970	Hæll	42.6mm
29 " 1973	Vestmannaeyjar	42.4 "
" " "	Eyrarbakki	40.0 "

Number of cases month by month: 22,12,24,10,14;21,16,25. These figures imply that the representativeness of the mean values and frequencies discussed below may be poor or very poor for half of the months concerned - for April in particular but also for February, May and November. For the remaining four months we may assume the mean values and frequencies to be fairly representative.

According to the 500 mb maps, a low - during the winter months a deep low - is centred to the north of W Iceland, probably near 70°N. The gradient is steeper and the curvature of the WSW flow less marked to the S than to the N^{cf} Iceland. The surface maps are much more different from one month to another, but most of them indicate the presence of a cold, low-tropospheric high over or near Iceland.]

[Gales are frequent and have occurred from any direction, though not very often from the sector SE to SW. Temperatures are low, with departures around -5° in the lower half of the troposphere and mostly within the interval -2 to -5 $\frac{1}{2}$ ° at the surface of the earth. The cloudiness is above average in W Iceland and along the N coast but below average in the easternmost part of the country. The distribution of precipitation is rather peculiar, with a large excess at the coastal stations in NE Iceland, a smaller excess in some interior parts of W Iceland, a small deficiency in the Breiðafjörður area and in the coastal areas of SW Iceland and a rather large deficiency in the SE.

Pressure and winds. At the 500 mb level a low - during the period November to March a deep low - is centred to the N of Iceland. According to the analysis shown on these maps, the centre of the low is usually near 70°N, but the analysis is more subjective in this case than in the case of most other types. North of Iceland the gradient is rather weak and the streamlines have a rather strong curvature; south of Iceland the gradient is steeper and the curvature less marked.

The surface maps are more complicated, more different from month to month and less easily interpreted. Most of them, however, indicate the presence of a cold, low-tropospheric high

over or near Iceland, drifting east with the upper flow and, as shown by the tendencies, often intensifying. A few maps (for May and October) suggest that there may be two such highs, but this is rather unlikely from a synoptic point of view; a possible explanation might be that the centre of the high was close to one position on about one half of the days concerned and close to another position on the remaining half.

In spite of the rather weak gradient shown on most of the maps no 2, the "mean max. wind" values are rather high, and the gale frequency (as defined), 15.8%, is exceeded by very few other types. The frequency distribution of the gales on 90°-sector: N 35%, E 31%, S 9% and W 25%, is an indication that a rather wide variety of synoptic situations may be associated with or develop from type 326; perhaps the most common among these are the deepening of a low over the Greenland sea and the subsequent displacement of such a low to a position sometimes N or NE, sometimes E or SE of Iceland.

As for the occurrence of severe and widespread gales on days referred to type 326, see Supplement, item D.

Temperature. The temperature departures of the lower troposphere vary, as shown by the 500 mb relative topography (see Supplement, item A), from $-3\frac{1}{2}^{\circ}$ in March to -6° in December. This implies that the mid-tropospheric cyclone N of Iceland has reached a mature stage, with air of polar or arctic origin moving E on the S side of the centre. The departures of the surface temperature are of the same order of magnitude but a little more variable, from $-2 - -3^{\circ}$ in February and October to around -5° in November and December. (The relatively large difference between October and November is probably not representative) The geographical distribution of the departures is rather similar from month to month: they are largest in NE Iceland (Grímsstaðir, Dec.: -6.6°) and on the NW peninsula (Hornbjargsviti, March: -5.6), smallest in the southernmost part of the country (Fagurhólsmýri, May: -1.6) and at the E coast (Dalatangi, Febr.: -1.5°). This difference between N and NW Iceland on one side, S and SE Iceland on the other reflects the temperature gradient in the lower half of the troposphere which may be deduced from maps no 1 and 2.

The maps showing mean max.-min. differences show, as for most other types, an area of relatively high values, 7-9° in most cases, in the interior of NE Iceland and locally in NW Iceland, contrasting with relatively low values, mostly 5-6°, at a majority of the coastal stations. The highest value for any station and month is 9.6° (Grímsstaðir, Jan.) and the lowest 3.4 (Vestmannaeyjar, Oct.) The values obtained at the stations in the interior are rather less than for most other types where a rapid development may ensue, probably because the polar air-mass is well established and no intrusion of much milder air is to be expected within 24 hours. (The mean max. temperatures for the winter months are below 0° ^{for this type} everywhere except in the coastal areas of the southern half of Iceland.)

Cloudiness. The overall mean value of the cloudiness (all stations and all months) is appr. 6 oktas and thus close to the climatologically normal value. The month-to-month variations, except on the local scale, are small - surprisingly small in view of the limited number of observations for some of the months. The geographical distribution is rather similar on the various monthly maps, high values (6-7 oktas) predominating in W Iceland and in particular along the N coast (Grímsey and Raufarhöfn, Nov.: 7.8-7.9 oktas), low values (mostly around 5 oktas) in SE Iceland (Hallormsstaður, April and Teigarhorn, May: 4.3 oktas).

Precipitation. In spite of the unsettled weather often associated with type 326, the 8-month sums of the daily precipitation amounts plotted (in green) on maps 7 are somewhat below the corresponding normal values in most of Iceland. There are, however, two well-defined exceptions: In the northernmost part of E Iceland, the percentage figure for Grímsey is 178 and for Raufarhöfn 205; and in W Iceland, an area of surplus extends southwards from the SW part of the Húnaflói area (Hlaðhamar 129%) to near the S coast (Eyrarbakki 99%). The first-mentioned area of excess does not extend as far S as the Mývatn area (Reykjahlíð: 81%), and the second area does not comprise the westernmost part of the country where ^awell-marked deficiency

prevails (Lambavatn: 59%, Keflavík: 72%). For all stations in E Iceland S of a line Akureyri-Dalatangi the percentage value is appr. 50. In absolute figures, however, the 8-month average of daily amounts show at last three maxima, one in the NE (Grímsey 3.4 mm), one in the NW (Hornbjargsviti 3.5 mm) and one in the SW (Eyrarbakki 3.9 mm), whereas the lowest values are found in the NE part of the interior (Grímsstaðir 0.5 mm).

The complicated distribution described above reflects the combined influence of a number of different synoptic situations which, with type 326 as a starting point, may bring precipitation to various parts of Iceland within a 24-hour period. To give a few examples, advection of somewhat milder air from the SW quadrant may be accompanied by snow or sleet mainly in the southwestern half of the country, and if a deepening polar low moves east near the N coast followed by increasing N or NW wind, considerable amounts of snow may be expected in a rather narrow belt along the E part of the N coast.

As some of the features shown on the monthly maps may be spurious, only those which are found on several successive maps will be mentioned below. The NE maximum seems to have a more easterly position during the three first months of the year (Raufarhöfn 3.1 and Grímsey 2.9 mm/day) than during the three last months (R. again 3.1 but Grímsey 4.9 mm/day); the surplus area in W Iceland is not present on the map for April and is limited to the Húnaflói area in May; an area of relatively large deficiencies is found in the central part of N Iceland in March, April and May and actually dominates the map for April (which is based, however, on 10 days only).

The maps no 8, analyzed to show the frequency of a daily amount of precipitation ≥ 1.0 mm, all indicate an area of low frequency in the interior of Iceland; the lowest frequency varies from about 30% to 0 (May). On most maps this area extends to the coast of E or SE Iceland, and on the map for May to the Faxaflói-Breiðafjörður district as well. Areas of high precipitation frequency are found mainly on the coast of NE Iceland (Raufarhöfn, March: 83%; Grímsey, Nov.: 75%), in the NW peninsula (Þórustaðir Feb.: 79%; Hornbjargsviti, Nov.: 88%) and in the coastal area of SW Iceland (Eyrarbakki, Feb. and Oct.: 86%). The two latter areas are well separated on some maps (May, November) but seem to coalesce on others (February,

March); on the map for April, a weak maximum in the Faxaflói area may be said to replace both of them.

Amounts as large as 40 mm are hardly to be expected with type 326 (see Supplement, item H).

Type 326 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	O	N	D
Rel. top.	511	513	517	519	524			524	516	511
Departure	-11	-11	-7	-9	-9			-11	-10	-12

B. Stations where the "mean max. wind" is relatively high low

Vestmannaeyjar (8)	Þórustaðir (8)
Hveravellir (6/7)	Reykjahlíð (8)
Grímsey (6)	Hæll (6)
Keflavík (6)	Hallormsst. (5)
Raufarhöfn (5)	

C. Frequency and direction of gales ("max. wind" \geq 30 knots).

Sum of possible number of days with a gale:

$$23 \times 146 - 63 = 3295$$

Actual number of days with a gale:

$$522 = 15.8\%$$

Distribution as to direction:

75	75	75
26		110
62		34
41		18
13	21	13

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported in 11 cases from Vestmannaeyjar, and in two of these also from Teigarhorn. One of these cases occurred

in each of the months January to March, three in May, two in October, two in November and one in December. The directions were: 70-90° in 6 cases (out of 13), 250-270° in two, 320° in one and 340-360° in 4 cases. The highest velocity reported was 68 knots (Vestmannaeyjar, 23 May 1961: 340° 68; Teigarhorn, 27 Nov. 1966: 360° 68). Widespread gales occurred on one day referred to type 326, namely on 12 Feb. 1965.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm	cold
Vestmanna. (7)	Grímsstaðir (8)
Keflavík (5)	Reykjahlíð (5)
Eyrarbakki (5)	Hornbjargsv. (5)
Fagurhólm. (5)	Þórustaðir (5)
Reykjavík (5)	
Kirkjub.kl. (5)	

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large	small
Raufarhöfn (7)	Teigarhorn (7)
Grímsey (7)	Fagurhólsmýri (6)
Hlaðhamar (6)	Dalatangi (5)
	Hallormsstaður (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high	low
Grímsey (8)	Teigarhorn (8)
Raufarhöfn (6)	Kirkjub.kl. (7)
Hornbjargsv. (6)	Dalatangi (6)
Síðumúli (5)	Hallormsst. (5)
	Reykjahlíð (5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

Only one case occurred at a station used for the present investigation:

Fagurhólsmýri 24 Oct. 1974: 46.6mm

Type 334.

Number of cases month by month: 30,30,19,23,30;30,29,27.
As seen from these numbers, 334 is a well-populated type; the representativeness of the mean values and frequencies discussed below is probably acceptable as far as *March and April* are concerned, and good for the remaining six months.

Type 334 is a well-defined type with a highly characteristic flow pattern, large temperature departures and very large contrasts as regards the precipitation regime.

At the 500 mb level a vigorous warm anticyclone is situated SE of Iceland, probably over or near the British isles, and an equally well-developed trough to the W, probably near the longitude of S Greenland. The circulation type is thus strongly meridional, with Iceland embedded in a warm SW or SSW current. At the earth's surface, too, the wind is mainly southerly or southwesterly; the influence of the Icelandic highlands is evident from a superimposed ridge near the S coast and a corresponding trough over N Iceland. The temperature departures at the surface are positive throughout; they are large or very large in the interior of E Iceland, but not quite as large in other parts of the country. The moisture-laden maritime air leads to frequent and abundant precipitation, at low altitudes almost exclusively in the form of rain, in the southwestern half of Iceland; occasionally, e.g. when the air is conditionally unstable, very large amounts may be released through the forced uplift in this area. As a striking contrast, NE Iceland, sheltered by the mountains, has usually dry and often fairly bright weather.

Pressure and winds. The 500 mb-maps for the various months are all very similar. The circulation is strongly meridional; Iceland lies within a rather strong SW or SSW current with an often well-marked anticyclonic curvature. To the right of this current a strong ridge or, perhaps more frequently, an anticyclone with a closed circulation, will be situated over or near the British isles. The trough to the left of the SSW current may be at the longitude of S Greenland or the Baffin Bay. The main air-mass boundary within the meridional flow will normally be found over the Greenland sea; the anomaly of the mean temperature

of the lower half of the troposphere at 65°N 20°W is +5-8°, which proves that Iceland is on the warm side of the boundary. Occasionally, however, a labilization process may have started through advection in the mid-troposphere of somewhat colder air, possibly of polar origin, from the SW.

The picture obtained from maps no 2, showing the pressure distribution at sea-level, is not quite as simple as that obtained from maps no 1. Here, too, the main direction of the geostrophic wind is SSW, but there are complications: in the SSW flow the highlands of Iceland form an important obstacle, which gives rise to a superimposed ridge near the S coast and a superimposed trough over N Iceland. Analogous distortions probably also exist on a smaller (meso-) scale, but can not be considered here because the analysis of the pressure field is based on data from a few stations only.

The "mean max. wind" values shown on maps no 3 are larger than for most other types. For a few stations they are higher than for any other type: Þórustaðir, Akureyri, Reykjahlíð, Hveravellir and - marginally - Hallormsstaður. To explain this, local topographic features must be taken into account, in addition to the generally favourable conditions for strong winds at the surface brought about by a steep gradient at sea-level and in the free atmosphere.

The gale frequency, 16.6% as defined, is one of the highest obtained by any type. The distribution as to direction is asymmetrical, as might be assumed from the maps showing the surface and 500 mb flow: 54% were from the S quadrant (135-225°), 39% from the W quadrant (for details, see Supplement, item C). Some of the gales were severe, widespread, or both, as detailed under item D in the Supplement.

Temperature. The high temperatures in the free atmosphere on days referred to type 334 may be seen from the anomalies of the relative topography (Supplement, item A). The excess varies from +5° in October to +8° in January. The surplus at ground level is, as usual in such cases, not quite as large; it is roughly 4-7° in January and February and 2-5° in March to May and October to December. The geographical distribution of these

anomalies is highly consistent: the largest departures are always found in the interior of E Iceland (Hallormsstaður, Jan.; +7.4; Grímsstaðir, Feb.: +7.3), the smallest in the coastal areas of SW, W and N Iceland (Hornbjargsviti, March: +1.7; Vestmannaeyjar, May: +1.6; Lambavatn, Nov.: +2.2).

It should perhaps be pointed out that the absolute level of the temperature is higher at the coast of S and W Iceland, even though the departure is smaller there. In other words: the warm air may be cooled on its way from the coast to the interior of E Iceland, but the amount of cooling is less than the difference with respect to normal temperatures between the areas concerned.

On maps no 5, showing the average max.-min. difference, the lowest values, mostly 3-5°, are found at coastal stations in S and SW Iceland; the April values for Vestmannaeyjar and Eyrarbakki are remarkably low, 2.1 and 2.4° respectively. The highest values, generally between 6 and 8° (in May 8-11°) are found in E Iceland, mainly in the interior but in some cases also at one or two coastal stations. The geographical distribution just described is natural because the maritime air-mass on its arrival at Iceland is usually thermally homogeneous but may become less homogeneous while travelling over land, as a result of vertical motion, vertical heat flux and perhaps radiative processes.

Cloudiness. In S and W Iceland type 334 is nearly always accompanied by compact layers of low and perhaps medium clouds; the monthly mean cloudiness figures are, almost without exception, 7-8 oktas in this area. Somewhat lower but still fairly high values, mostly 6-7 oktas, are found along the N coast from Hraun to Raufarhöfn. In the interior of NE Iceland, however, the clouds often break up; the mean amounts in this area and on the E coast are generally within the interval 5-6 oktas.

The month-to-month variations in cloudiness are strikingly small, with hardly more than one exception: in most of N Iceland the values for May are $1 - 1\frac{1}{2}$ oktas lower than those for April, probably an effect of the increased radiation and the reduced extent of the snow-cover.

Precipitation. The picture obtained from the monthly maps of precipitation amounts (in % of normal amounts) is basically a simple one, but at the same time one of large contrasts. In practically all of S and W Iceland each month receives more than the normal

amount, and the 8-month total is generally 2-4 (at Hæll more than 4) times that amount. In NE Iceland, on the other hand, type 334 is dry, in the interior very dry, with monthly percentage figures mainly between 10 and 50%. The boundary between the area of surplus and that of deficiency extends roughly from Grímsey west and south of Akureyri to the SE coast S of Teigarhorn.

As in the case of the mean cloudiness the month-to-month changes with respect to relative amounts of precipitation are smaller than for most other types.

According to the maps no 8, a large area where the frequency of an amount of precipitation ≥ 1.0 mm is more than 70%, and smaller areas where the said frequency is more than 90%, are found in S and W Iceland during the whole period October to April; in October, the frequency exceeds 70% in more than half of Iceland and 90% in a large area. In May, however, the frequencies are mostly between 40 and 70% in the area concerned. On the other hand, an area where the frequency of an amount ≥ 1.0 mm is less than 10% is found in NE Iceland on all monthly maps except the map for October (where the lowest values are appr. 15%).

In the greater part of southern and western Iceland the frequency of large amounts of precipitation for type 334 exceeds the frequencies obtained by all other types. According to maps no 8, 73% of all January days at Þórustaðir and 72% of all November days at Hæll receive 10.0 mm or more, to give a few examples. Among the days when an amount exceeding 40 mm occurred, more than 20% were referred to type 334. For further details, including a list of cases when a daily amount of 60-130 mm were reported, see Supplement, item H.

Type 334 (Supplement).

A. 500 mg relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	J	J	A	S	O	N	D
Rel. top.	538	537	537	540	544	545	541	536				
Departure	+16	+13	+13	+12	+11	+10	+15	+13				

B. Stations where the "mean max. wind" is relatively high low

- Vestmannaeyjar (8) Lambavatn (8)
- Hveravellir (7/7) Kirkjub. kl. (8)
- Reykjavík (8) Hæll (8)
- Stykkish. (6) Þórustaðir (7)
- Hornbjargsv (5) Teigarhorn (7)

C. Frequency and direction of gales ("max. wind" \geq 30 knots).

Sum of possible number of days with a gale:

$$23 \times 218 - 130 = 4884$$

Actual number of days with a gale:

$$809 = 16.6\%$$

Distribution as to direction:

12	1	1
34		11
84		9
197		23
129	225	83

D. Severe gales (\geq 60 knots).

A wind velocity \geq 60 knots was reported on 7 days: 1 in Jan. (from two stations), 3 in Feb., 2 in March and 1 in Dec. The stations implied were Stykkishólmur, Grímsey, Teigarhorn, Vestmannaeyjar (3 cases) and Hveravellir (2 cases). This

is one out of only two cases where less than half of the severe gales reported on days referred to a certain type occurred at Vestmannaeyjar. The directions were: 170-200° (5 cases), 270-290° (2 cases), 320° (1 case). The highest velocity was reported from Grímsey on 14 Dec. 1975: 290° 68 knots.

As many as six widespread gales occurred on days referred to type 324. Only two of these (5 March 1969 and 14 Dec. 1975) are also classified as severe (max. wind \geq 60 knots). The other cases occurred on the following days: 4 Nov. 1965, 27 Feb. 1968, 24 March 1970 and 8 Dec. 1970.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm cold

Hallormsst.(8) Lambavatn (7)
Akureyri (8) Vestmannaeyjar (7)
Grímsstaðir(8) Hornbjargsv.(6)
Reykjahlíð (8)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high low

Síðumúli (8) Hallormsst.(8)
Lambavatn (7) Dalatangi (8)
Keflavík (6) Teigarhorn (8)
Eyrarbakki(6) Grímsstaðir(8)
Stykkish. (5) Reykjahlíð (7)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large small

Hæll (8) Dalatangi (8)
Þórustaðir(7) Hallormsst.(8)
Lambavatn (7) Reykjahlíð (7)
Síðumúli (6) Grímsstaðir(5)
Stykkish. (5) Teigarhorn (5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A very large number of daily amounts of precipitation ≥ 40.0 mm - in fact, a larger number than for any other type, and more than 20% of all such cases - occurred on days referred to type 334. The distribution was as follows:

J	F	M	A	M	J	J	A	S	O	N	D	Σ
8	10	1	3	5				12	19	55	63	
6	4	1	3	5				7	9	3	38	

The figures of the first line give the number of cases among

the 23 stations used for the present investigation; the figures of the second line give the number of days on which one or more of these cases occurred. The following stations were implied:

Stykkishólmur (3 cases), Lambavatn (5), Þórustaðir (15), Hornbjargsviti (2), Teigarhorn (1), Fagurhólsmýri (9), Kirkjubæjarklaustur (6), Vestmannaeyjar (5), Hveravellir (3), Hæll (8), Eyrarbakki (4) and Keflavík (1).

The amount exceeded 50 mm in 33 cases and 60 mm in the following 17 cases:

22 Jan. 1972	Þórustaðir	71.3 mm	18 Nov. 1958	Stykkirhólmur	61.2 mm
15 " 1967	Fagurhólsmýri	87.4	" " "	Þórustaðir	63.9
" " "	Kirkjubæjarkl.	62.9	4 " 1965	"	128.3
23 Feb. 1972	Þórustaðir	99.0	18 " 1966	Fagurhólsmýri	68.3
7 " 1960	Fagurhólsmýri	93.9	8 " 1975	"	87.4
26 " 1974	Hveravellir	60.3	7 " 1973	Vestmannaeyjar	67.8
20 Oct. 1965	"	109.5	14 " 1961	Eyrarbakki	100.5
" " "	Hæll	75.6	30 Dec. 1971	Þórustaðir	83.1
14 Nov. 1961	Lambavatn	106.4			

Type 335.

Number of cases month by month: 25,28,25,20;23,23,27.

As these numbers are all rather close to the averages (21-23 depending on the number of days of the month) we may expect the mean values and frequencies discussed below to be fairly representative.

On the 500 mb maps Iceland is seen to lie in the middle of a strong and fairly straight SW current. The surface maps (no 2) show the typical distortion of the SW current due to the Icelandic highlands. The air mass over Iceland is, according to the departures of the 500 mb relative topography, not subtropical but still rather mild. Positive temperature departures prevail at the surface, too, but there are a few exceptions mainly in the NW peninsula; the largest surplus, +3-4°, is found in the interior and eastern parts of the country in January and February. Apart from areas in NE Iceland where foehn processes may lead to the dissolution of clouds, the weather associated with type 335 is generally cloudy or overcast, with very large mean values for the cloudiness at several stations in W and SW Iceland. In this part of the country large amounts of precipitation may be expected, above all in a belt extending from the Breiðafjörður area southeastward to the central part of the S coast. In most of NE Iceland the amounts are not far from normal but, taking the eight months together, slightly on the dry side. The frequency distribution of days with at least 1.0 mm of precipitation confirms the simple picture obtained from the maps showing precipitation amounts.

Pressure and winds. According to the 500 mb maps the mid-tropospheric flow in the Icelandic area is southwesterly, fairly straight and rather strong. As usual, the gradient is shown to be less on the maps for May than on all other maps. A strong ridge appears to be found over the British Isles or a little farther east, a deep trough or a high-reaching low somewhere over Greenland. The temperature contrast between the ridge and the trough may be large or very large, but in the middle of the SW current the air may be assumed to be modified polar air. On the surface maps the general flow is also SW, but the distortion caused by the Icelandic highlands is clearly seen: a ridge is shown over the southernmost part of Iceland (indicating that SE

or even E winds may occur along the western part of the S coast), a trough in the vicinity of the N coast. The pressure tendencies are mostly small or moderate, with some preponderance of negative values corresponding to a slow progression eastwards of the Rossby wave.

The "mean max. wind" values shown on maps no 3 are fairly high. They are, as always, higher at most coastal stations than in the interior, but the difference between coast and inland is rather less than usual, which may reflect the low degree of thermal stability associated with the advection of maritime polar air. The gale frequency, 16.9% as defined, is surpassed by two other types only (116 and 336). 50% of the gales were from the SW quadrant; northerly gales were infrequent. For details concerning severe and widespread gales, see Supplement, item D.

Temperature. According to the 500 mb relative topography (Supplement, item A) the lower half of the troposphere is on an average $1-2^{\circ}$ too warm compared with the normal values for respective months. These small positive departures confirm the assumption that the air mass usually associated with type 335 is polar air which has travelled E or SE across North America (perhaps leaving the continent near 40° latitude) and then NE across the N Atlantic, taking up heat and moisture from the sea surface during this part of its trajectory and arriving in the Icelandic area as relatively unstable and humid polar maritime air.

The temperature departures at the surface of the earth, as shown on maps no 4, are mostly within the range $0-+1\frac{1}{2}^{\circ}$ except in January and February when they are somewhat larger, appr. $2-4^{\circ}$ at most places. Combining these figures with the corresponding departures of the relative topography, it may tentatively be concluded that the air mass is likely to be more unstable in January and February than during the other months concerned. The geographical distribution of the departures is remarkably persistent: they are largest in the NE and smallest in the NW. At Hallormsstaður the 8-month mean departure is $+2.4^{\circ}$, at Hornbjargsviti as low as -0.2° . Negative departures - probably reflecting the occasional intrusion of colder air from southernmost Greenland or the adjacent sea - occur in NW Iceland mainly in March, November and December.

The maps no 5, showing the mean difference between daily max. and min. temperatures are all similar in their broad features. They show low values - mostly $4-5^{\circ}$ - in the coastal areas of SW Iceland, which is natural considering the homogenous character of the surface air after its having crossed the Atlantic. The corresponding differences are of the order of $6-8^{\circ}$ in the interior of NE Iceland, and during some months in most other interior parts of the country too. On the meso-scale the contrast between Lambavatn (directly exposed to the SW winds) and Þórustaðir (in a more sheltered position) is noteworthy; the max.-min. differences at the latter station are consistently $1-2^{\circ}$ larger than at the former.

Cloudiness. Low clouds of St- or Sc-type as well as clouds of a convective type are characteristic for the maritime air mass invading Iceland from the SW, and as long as the air is, on the whole, ascending, the amount of clouds remains large or very large; in the W half of Iceland the mean cloudiness associated with type 335 is mostly $6\frac{1}{2}-7\frac{1}{2}$ oktas. In the NE part of the country foehn processes, i.a., tend to reduce the amount of clouds; at the stations Reykjahlíð, Grímsstaðir, Hallormsstaður, Dalatangi and Teigarhorn the monthly means are generally 5-6 oktas. It may be mentioned that not only Grímsey but also Akureyri belongs to the area where the cloudiness is high (6-7 oktas at these two stations); Raufarhöfn and Kirkjubæjarklaustur are within the transition zone. The month-to-month variations of mean cloudiness are smaller than for most other types.

Precipitation. The picture obtained from maps no 7, showing the amount of precipitation in % of the normal amount, is a fairly simple one, and in its broad features persistent from month to month. A large area, comprising (with insignificant exceptions) the entire W half of Iceland, usually all or most of SE Iceland and sometimes a considerable part of NE Iceland, too, receives more than 100% of the normal amounts. The core of this surplus area is usually found in the interior of SW Iceland, where the percentage figure for Hæll is 300 or more during the five first months and 235-300 during the three last months of the year; the values for February (13.8 mm as against 2.9 in the "normal" case) and April (12.7, to be compared with 2.4) are outstanding. A particularly large surplus is also reported from Þórustaðir in April

(9.2 mm or 460% of the normal amount). In October and December the largest excess is found farther N resp. NW than in the other months concerned; the October values for Síðumúli are 10.6 mm and 380% while the December values for Hlaðhamar are 4.4 mm and 315% respectively. It is clearly seen from the maps that the surplus increases as the air advances from the coast towards the highlands in the interior; it may be mentioned that none of the stations specifically mentioned above is within an area where the orographic effects are considered to be unusually strong, and it is quite possible that minor areas, e.g. on the SW slopes of Hofsjökull or Mýrdalsjökull, would show excess values even larger than those quoted above.

An area of deficient precipitation is found in the eastern half of Iceland on all monthly maps, but its extent varies considerably. It is large in December, when it comprises the whole eastern half of Iceland except the south coast and the north coast west of Þistilfjörður; it is also rather large, comprising more than half of NE Iceland, in January, October and November; it is small during the period February to May. The deficiencies are mostly small or moderate, but in a few cases the amount obtained by one or two among the stations Akureyri, Grímsstaðir and Dalatangi is less than one third of the normal amount for the month concerned.

Maps no 8, illustrating the frequency of a precipitation amount ≥ 1.0 mm, are in their general features rather similar to the maps discussed above. A few minor differences may, however, be noted. The month-to-month variations of the "dry" area in the NE are less marked on the frequency maps than on those showing relative amounts of precipitation, and the largest frequencies are found about as often at the coastal stations of W Iceland as within the area of maximum relative excess. It may further be noted that in most of the monthly maps several stations in W and S Iceland have conspicuously large frequencies, 1.0 mm or more occurring on 90-95% of all days. The frequency of larger amounts, 10 mm or more, is also remarkable in a number of cases: in Háll the figure for February is 52% and that for April 60%, and as far east as Fagurhólsmýri 56% of all March days referred to type 335 received at least 10 mm of precipitation.

A particularly large daily amount, 40 mm or more, was reported in a fairly large number of cases: 18 cases, six of them referring

to one and the same day (28 Feb. 1968) when more than 140 mm was measured at Hveravellir. For further details, see Supplement, item H.

Type 335 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	•	O	N	D
Rel. top.	525	526	529	532	534		536	529	526
Departure	+3	+2	+5	+4	+1		+1	+3	+3

B. Stations where the "mean max. wind" is relatively high low

Vestmanneyjar(8)	Þórustaðir (8)
Hveravellir(7/7)	Teigarhorn (8)
Keflavík (8)	Hæll (7)
Reykjavík (7)	Kirkjub.kl.(7)
Grímsey (5)	Lambavatn (5)

C. Frequency and direction of gales ("max. wind" ≥ 30 knots).


Sum of possible number of days with a gale:

$$23 \times 194 - 124 = 4338$$

Actual number of days with a gale:

$$732 = 16.9\%$$

Distribution as to direction:

	16	7	13
25			43
85			28
162			31
95	131		96

D. Severe gales (≥ 60 knots).

A wind velocity ≥ 60 knots was reported on 15 days (in one case from two stations): 2 in Jan., 2 in Feb., 1 in March, 1 in Oct., 5 in Nov. and 5 in Dec. The stations implied were Vestmannaeyjar (13 cases), Síðumúli (1 case) and Grímsey (2 cases). The wind directions observed in these cases were 90-110° (3 cases), 180-200° (5 cases), 220-250° (3 cases) and 270-290° (5 cases). The highest velocity reported was 220° 72 knots at Vestmannaeyjar on 14 Nov. 1958. Widespread gales occurred on three days referred to type 335: 3 Dec. 1958, 20 Feb. 1972 and 20 Dec. 1972.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm

cold

Hallormsst.(7) Hornbjargsv.(7)
 Dalatangi (7) Lambavatn (7)
 Reykjahlíð (7) Stykkish. (6)
 Akureyri (6) Þórustaðir (5)
 Eyrarbakki (5) Hraun (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high

low

Síðumúli (8) Teigarhorn (8)
 Stykkish.(8) Hallormsst.(8)
 Lambavatn(7) Reykjahlíð (7)
 Hlaðhamar(6) Dalatangi (7)
 Grímsstaðir(7)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large

small

Hæll (8) Hallormsst.(8)
 Síðumúli (8) Dalatangi (7)
 Hlaðhamar (6) Reykjahlíð (7)
 Þórustaðir(5) Raufarhöfn (5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount ≥ 40.0 mm was reported on 12 days referred to type 335 - on one day (28 Feb. 1968) from 6 stations and on two other days from two stations each day. The distribution of days was: 3 in Jan., 2 in Feb., 1 in March, 3 in April, 1 in each of the following months: May, October and December. The stations implied were:

Teigarhorn Fagurhólsmýri⁴ and Hveravellir 3 each; Stykkishólmur and Kirkjubæjarklaustur 2 each; Hæll and Eyrarbakki 1 each. An amount ≥ 60.0 mm was observed on four occasions:

28 Feb.	1968	Hveravellir	142.8 mm
" "	"	Hæll	74.8 "
17 April	1960	Fagurhólsmýri	67.8 "
10 "	1971	Þórustaðir	60.3 "

Type 336.

Number of cases month by month: 24,34,32,26,16;15,29,19. The figures for May and October are probably too small to give fully representative mean values and frequencies, and the same may apply to the December figures. In all other cases we may assume the mean values and frequencies discussed below to be satisfactory from this point of view.

The 500 mb maps are all dominated by a deep cyclone centred near the east coast of Greenland, between Angmagssalik and Scoresbysund. At the earth's surface the corresponding low may sometimes have its centre as far east as the N coast of Iceland. The surface maps show the usual distortion of the SW current, in particular a ridge on the windward side of the highlands. The "mean max. wind" values are very high, and so is the gale frequency; most of the gales were southwesterly or westerly, and a relatively large proportion of them were severe, widespread, or both. The cyclone dominating the pressure field is of the mature type, and its main frontal system is to be found E of Iceland, but the air mass invading Iceland from the SW is only moderately cold, and the departures of the surface temperature are mostly within the interval -2 to +1°. Cloudy weather with frequent and often abundant rains prevails in the western half of Iceland and eastwards along the S coast, whereas bright intervals and normal or somewhat sub-normal amounts of precipitation may be expected in the northeastern part of the country.

Pressure and winds. The 500 mb maps all show a deep cyclone in almost the same position, near the east coast of Greenland between Angmagssalik and Scoresbysund. Iceland is within the cyclonically curved SW flow in the SE quadrant of this vortex. The gradient is strong or very strong during the winter months but decreases considerably from February to May. According to the surface maps a low is usually centred near the W or N coast of Iceland; the exact position is seen to vary irregularly from month to month, but these variations may not be representative. Near the S coast the SW current is distorted in the usual fashion by a superimposed ridge on the windward side of the highlands. The pressure tendencies are generally positive, in November and December fairly large - an indi-

cation that the cyclone has reached its maximum development and is now gradually declining.

The "mean max. wind" values shown on maps no 3 are large; for Vestmannaeyjar they are 40-47 knots, except in April and May, and at some other highly exposed stations, including Reykjavík, they are as high as 30 knots during one or more months. In agreement with this the gale frequency (as defined) is very high, 20.8%; only one type, namely 116, has a marginally higher value (21.2). Almost one half of all gales were from the 60°-sector 225-285°, but all other directions except E and ESE were represented by a fair number of cases. A relatively large proportion of the gales were severe, widespread, or both; for details, see Supplement, item D.

Temperature. According to the anomalies of the 500 mb relative topography (see Supplement, item A), the temperature of the lower half of the troposphere is on an average somewhat below normal when type 336 prevails; the departures of the various months are between $-\frac{1}{2}$ ° (Jan., Nov.) and -3 ° (Feb.). This indicates that the cyclone is since long occluded, and the air in its SE quadrant is of polar (or perhaps even arctic) origin, although it has been modified while travelling across a part of the North Atlantic ocean south of Greenland. As shown by maps no 4, the temperature departures at the surface are also mainly negative; they are relatively large, appr. -2 to -4 °, in December, but otherwise mostly rather small. Positive departures, generally less than 1 °, are prevalent - except in NW Iceland - in January and February, in the eastern half of the country in October and near the east coast in April and May. All months agree with respect to the geographical distribution of the temperature anomalies: it is relatively cold in the NW and relatively mild in the E part of the country.

The geographical distribution of the max.-min. differences (maps no 5) is also, broadly speaking, similar from month to month: the said difference is relatively large in the interior and eastern parts of Iceland, but small in the coastal areas of SW Iceland. The lowest value, $3\frac{1}{2}$ °, is found at Vestmannaeyjar in October, and the highest, $9\frac{1}{2}$ °, at Hallormsstaður in December; in the latter case a rapid change from mild SW winds ^{*}(mean min.: -5 °) may explain the rather large value. The March value for Þórustaðir, 8 °, is of a more local character but otherwise equally remarkable.

^{*}/(mean max: $+4$ °) to relatively calm and clear weather

Cloudiness. After taking up heat and moisture while crossing a part of the N Atlantic, the air invading Iceland from the SW will usually be almost saturated in the lowest kilometer or so of the troposphere, and its lapse-rate will be approximately moist-adiabatic. This means that conditions are favourable for the development or preservation of Sc (in some instances also St) clouds as well as convective clouds of variable vertical extent. The cloudiness figures for all stations in W and S Iceland are consequently large, mostly in the interval $6\frac{1}{2}$ - $7\frac{1}{2}$ oktas. Farther east the rugged topography, the descending air motion in lee of the mountains, and perhaps radiation processes combine to cause a partial, and sometimes a complete, dissolution of these clouds; the mean cloudiness at Hallormsstaður is as low as $4\frac{1}{2}$ oktas. It is clear from the figures - which are remarkably persistent from month to month - that a well-defined boundary exists between large and small average values of the cloudiness; this boundary is found close to Raufarhöfn, passes between Reykjahlíð and Akureyri and reaches the south coast not far from Kirkjubæjarklaustur.

Precipitation. With one or two insignificant exceptions, the average amounts of precipitation on days referred to type 336 are above normal in the western half of Iceland and in the southern part of the eastern half. The magnitude of the excess varies, however, appreciably from month to month. In the core area, usually found in the interior east of Breiðafjörður, Snaefellsnes or Faxaflói, the amounts of precipitation are about four times the normal amount in January and May and otherwise approximately 2-3 times that amount. As far east as Teigarhorn three months, January, March and May, receive 175-200% of the normal amount, and the same applies to Raufarhöfn in March and November; at the latter station May has an even larger surplus. On the other hand, 5-7 out of 8 months show a deficiency at Reykjahlíð, Grímsstaðir and Dalatangi. At the latter station the average amounts for October to December are 25-30% of the corresponding normal amounts. The boundary between the "wet" and the "dry" area is sharp in this part of Iceland: the 8-months average amount per day referred to type 336 is 2.1 mm at Dalatangi but 5.4 mm at Teigarhorn.

As in most other cases, the picture conveyed by the maps no 7 is confirmed by that obtained from maps no 8. An area of large or very large frequencies coincides, more or less, with the southwestern

half of Iceland; within this area several stations, both at the coast and in the interior, have at least 1.0 mm of precipitation on 95-100% of all days referred to type 336 in January, and the figures for the other months are not much lower. On the other hand, Grímsstaðir - near the core of the dry area in NE Iceland - receives 1.0 mm or more on as few as 18% of all days referred to ~~the~~ type concerned.

The frequency of large daily amounts of precipitation is relatively low, as seen from item H in the Supplement. The reason for this is presumably the limited supply of precipitable water ~~con~~ contained in the rather cold and originally dry air mass at the time when it reaches the S and W coasts of Iceland.

Type 336 (Supplement).

A. 500 mb relative topography (geopotential dekameters) at 65°N, 20°W, with departures from monthly mean values:

	J	F	M	A	M	O	N	D
Rel. top.	521	518	519	523	531	531	525	518
Departure	-1	-6	-5	-5	-2	-4	-1	-5

B. Stations where the "mean max. wind" is relatively high

	high	low
Vestmannaeyjar	(8)	Þórustaðir (8)
Hveravellir	(8)	Hæll (8)
Keflavík	(7)	Lambavatn (7)
Reykjavík	(7)	Teigarhorn (7)
Grímsey	(6)	Kirkjub.kl.(5)

C. Frequency and direction of gales ("max. wind" ≥ 30 knots).

Sum of possible number of days with a gale:

$$23 \times 195 - 119 = 4366$$

Actual number of days with a gale:

$$907 = 20.8\%$$

Distribution as to direction:

55	40	39
53	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>	74
172		22
256		12
84	66	34

D. Severe gales (≥ 60 knots).

A wind velocity ≥ 60 knots was reported on 21 days (on four of these from two stations): 6 in Jan., 6 in Feb., 1 in March, 1 in April, 2 in Oct., 3 in Nov. and 2 in Dec. The stations implied were Vestmannaeyjar

(18 days), Hornbjargsviti

and Grímsey (2 days each), Reykjahlíð, Teigarhorn and Hvera-

vellir. The following sectors were represented: 90-110° (4 cases), 140-180 (4 cases), 200-230 (6 cases), 250-290 (9 cases) and 320-340° (2 cases). A velocity exceeding 80 knots was re-

ported once: Vestmannaeyjar, 18 Feb. 1959, 220° 85 knots.

Widespread gales occurred on no less than 7 of the days referred to this type, which is more than for any other type.

The days concerned were: 16 Jan. 1958, 15 and 18 Feb. 1959, 23 Oct. 1963, 22 Dec. 1972, 31 Dec. 1974 and 2 Jan. 1975.

E. Stations which, according to the anomalies of monthly mean temperature, appear as

warm cold

- Dalatangi (8) Hornbjargsv.(8)
- Teigarhorn (8) Þórustaðir (8)
- Hallormsst.(8) Lambavatn (8)
- Eyrarbakki (6) Hraun (6)
- Akureyri (6) Stykkish. (5)

F. Stations whose monthly means of cloudiness, compared with those of other stations, are

high low

- Lambavatn (8) Hallormsst.(8)
- Síðumúli (7) Dalatangi (8)
- Þórustaðir(6) Teigarhorn (8)
- Stykkish. (6) Reykjahlíð (8)

G. Stations whose monthly amounts of precipitation, expressed in % of the normal amounts, appear - in comparison with corresponding figures for other stations - as

large small

- Síðumúli (8) Grímsstaðir(8)
- Hlaðhamar (8) Dalatangi (8)
- Hæll (7) Reykjahlíð (6)
- Þórustaðir(5) Hallormsst.(5)

H. Large daily amounts of precipitation (≥ 40.0 mm).

A daily amount ≥ 40.0 mm was reported on six days referred to type 336, in each case from one station only: two days in February, two in March and two in November. The stations implied were Þórustaðir (three cases, including 73.8 mm on March 13 1969 and 40.4 mm on the following day), Vestmannaeyjar (one case) and, rather unexpectedly, Teigarhorn (two cases).

Explanations to the maps

Map no 1. The plotted figures show the mean height of the 500 mb surface in geopotential dekameter; the first figure (usually 5, in a few cases 4) has been omitted. The mean represents those days which have been referred to the type in question; the number of days is shown (upper right corner of the map sheet) together with the three-digit figure identifying the type. - In performing the analysis it was found that in many cases it would have been desirable to know the decimal of the mean value given (although this decimal would, of course, be quite uncertain whenever the number of cases was small); however, as the decimal was unknown, it was assumed to be 0 (to minimize the largest possible error).

Map no 2. Three mean values of the atmospheric pressure have been plotted where available: for 03, 09 and 15 GMT - those for 03 GMT in relatively large figures. For Hornbjargsviti the 15 GMT mean value is usually missing (because of incomplete data); for Grímsey, Eyrarbakki and also for Hornbjargsviti the 03 GMT-value had to be interpolated. By the interpolation it was assumed that the 6-hour changes of mean pressure varied smoothly all over Iceland. The possibility of a systematic geographic variation of the diurnal pressure variation was thus not taken into account; it was gradually found that it might have been desirable to do so, in particular it might have led to more acceptable (slightly higher) 03 GMT mean values for Grímsey than those on which the analysis was actually based. All non-interpolated figures are based on a complete set of data. The mean 12-hour pressure changes from 03 to 15 GMT were added in red. For Grímsey and Eyrarbakki these "tendencies" were given in parentheses, to indicate that they were partly based on interpolated figures for the mean pressure.

Map no 3. Wind data for 03, 09, 15 and 21 GMT were used for the analysis, but in many cases some or all data for one or two of these hours (most often 03 GMT, but for two stations also 15 GMT) were missing. Whether all data for a given day were available or not, the highest wind velocity reported was picked. The average was formed from the velocities thus selected. It does

not, therefore, represent a certain hour; on the other hand, it is not a perfect representative of the maximum wind velocity, as this would normally occur outside the few observation hours on which the analysis is based. It was thought, however, that the mean values, in spite of this deficiency, would be suitable to illustrate, when taken together, any geographical differences, any systematic variation over the year for a given type and station, and the inequalities existing in this respect at any given station and month between the various types. The symbols used on the map were intended to facilitate the orientation on the map but are, admittedly, more or less redundant.

Map no 4. Departure of mean temperature from its normal value. The "mean temperature", in this connection, is the average of the diurnal means for all days referred to the type concerned. Diurnal mean temperatures are defined in agreement with current practice in Iceland. If the number of days available for computing the average for a given station is less than 90% of the number of days referred to the type (as is usually the case as far as Hveravellir is concerned), the mean value is given in parentheses and not necessarily accepted when the isolines were drawn. A small figure placed as an index to the temperature departure shows the number of days used for the computation if not all data were available. If more than half of all days were missing, no mean value is plotted.

The "normal value" is the mean temperature for the period 1931-60 officially approved by Veðurstofan. No adjustment was made with respect to the "mean date" of the days referred to a given type; although this mean date will not normally coincide with the exact mid-point of the month concerned, the correction would always have been negligible in January, February and December and small or very small as far as the other five months are concerned.

By the analysis isolines were drawn for every other degree (... -4, -2, 0, +2, +4 ...), and for intermediate degrees if so required. With very few exceptions, even mean values which were thought to be, for some reason, a little off the mark were accepted for the analysis.

Map no 5. The figures plotted on this map are: mean daily temperature (red), mean daily minimum temperature (blue), mean difference between daily extremes (black). If, as is often the case, a mean value had to be computed from an incomplete series of data, the number of available observations is given as an index, and parantheses are used to show that more than 10% of the data are missing. In a few cases the number of available data is not the same for the maximum and the minimum temperature; it may then happen that the "mean difference" which might be obtained from the "mean max. temp." and the "mean min. temp." differs from the black figure entered on the map, but in such cases the black figure may nevertheless be a fair estimate of the derived element concerned.

The analysis refers to this element: the mean difference between daily maximum and daily minimum temperature (not to be confused, of course, with the periodic diurnal amplitude of the temperature, which is smaller, in winter more or less negligible). The broad features of this element are probably real, to some extent at least, but it has to be admitted that the values for several stations - in particular Eyrarbakki and Þórustaðir - on many of these maps, even though they were not completely refuted for the purpose of the analysis, are probably strongly affected by local factors and not truly representative for any larger area. Such local factors, on the other hand, may be assumed to be of some importance in many places; a true representation of the element concerned would probably show a very complicated pattern, and would be far beyond the scope of the present study.

Map no 6 represents the mean cloudiness at 03, 09, 15 and 21 GMT. As for some of the other maps, a number of complications arose wherever the mean values had to be based on incomplete series of data. The number of available data is given in a row below the cloudiness figures themselves, except when a complete series is available for all four observation hours; a letter 'K' is used in case one or more but not all of the mean values could be derived from a complete series. The mean values themselves (unit: tenths of oktas) are plotted to the left (for 03 and, below, 09 GMT) and to the right (for 15 and, below, for 21 GMT). The value for 03 GMT is relatively often missing, and where it is available it may be rather uncertain because of observational difficulties;

further, the value for 21 GMT was considered rather too far off from the hour represented by map no 1 and used as a base for the sorting of the days into types. Therefore, a mean value was computed which was based (almost) exclusively on the mean values representing 09 and 15 GMT. The rules according to which these mean values (plotted in black above the station ring) were obtained may be summarized like this: if the figures for mean cloudiness (tenths of oktas) for 09 and 15 GMT are both even or both odd, take the mean value; if one is even and one odd, pay regard to the mean values for 03 and 21 GMT (as available) in deciding which of two adjacent figures should be taken as the mean value. (Example: for Akureyri, January, type 216, the mean values for the four hours are, in due order, 71, 74, 63 and 53. In choosing between 68 and 69, 69 is preferred because it is closer to the mean value of 71 and 53.)

After obtaining this mean value, it is depicted by means of the cloudiness symbols used in synoptic practice. If the last digit is 5, the choice between the two alternatives is made according to rules similar to those given above.

Map no 7. The figures plotted on this map are: mean amount of precipitation per day (green) and this amount expressed as a percentage of the normal amount (blue). The isolines refer to the blue figures.

For the purpose of this map, the normal amount of precipitation per day was obtained by dividing the normal monthly amount of precipitation by the number of days of the month concerned.

If one or more days are missing, the available number of days is given as an index. The mean values (in mm and in %) are given within parentheses if more than 10 but not more than 50% of all data are missing, and omitted if the 50%-limit is exceeded.

An analysis of the absolute amounts of precipitation was deemed impracticable because of the large variations due to geographic factors. It might perhaps be argued that the analysis of the relative amounts, as endeavoured on maps no 7, is almost as futile, as the effect, e.g., of a mountain barrier depends on the wind conditions which, in their turn, are closely related to the type as such. Nevertheless, the actual contrasts

with respect to precipitation stand out quite well on the maps, and the analysis did not appear as an almost impossible task. It should be stressed, however, that in the present case the main purpose of drawing the isolines was not to give a fully realistic picture of how things really are, but rather to use a convenient and conventional method of presenting the available facts, i.e. the figures plotted on the maps, in a straightforward and readily digestible manner. It is conceivable, in fact probable, that even a small number of additional stations in key positions (i.e. near the westernmost point of Snæfellsnes, or between Raufarhöfn and Dalatangi) might cause a distinctive change with respect to some details of maps no 7, yet many of the general features of these maps are well corroborated and thus in themselves tend to justify venturing an analysis.

Map no 8. The figures plotted represent, for each station, the frequency of an amount of precipitation equal to or exceeding the following limits: 0.1 (NW quadrant), 1.0 (SW quadrant), 5.0 (NE quadrant) and 10.0 (SE quadrant). The figures are those obtained directly from the observational data, without any smoothing. The analysis refers to the frequency of an amount ≥ 1.0 mm.

In addition to the difficulties encountered in the analysis of map no 7, a minor problem arose in analyzing map no 8: the figures are based on rather few cases - mostly 15-30, but occasionally 10 or less - and the last digit may have little meaning. It was deemed best, however, to take even such doubtful figures as they stand.

Plotting models for maps 1-8.

(The figures given below refer to the maps for type 114, December, Reykjavík, if not otherwise stated.)

Map no 1. See "Explanations to the maps".

Map no 2. ^{26.3} ^{26.6}
^{26.7} ^{+0.3} The figures represent the mean values for 03 GMT (26.3 : 1026.3 mb), 09 GMT (26.7) and 15 GMT (26.6), and the 12-hour change from 03 to 15 GMT. - The analysis refers to 03 GMT.

Map no 3. "Mean max. wind" as defined (see "Explanations"). The following symbols were used:

•	"Mean max. wind" <	10 kn
○	" " "	10-19
●	" " "	20-29
▲	" " "	30-39
■	" " "	≥ 40

If the number of days available for computing this mean value is less than the number of days referred to the type, the former number is given as an index. For Keflavík, e.g., the number of days available is 8 rather than 15. If the proportion of missing data is less than 10% (see Keflavík, type 114, October), no parenthesis is used; if it is at least 10 but not more than 50%, as for Keflavík, December, the mean value and the amount of data are given in parentheses; if more than half of all data are missing, a x is entered at the position of the station (Hveravellir, type 114, October), and no other entry is made.

Map no 4. Mean departure of the 24-hour mean temperature from the mean value of the month concerned. For details, see "Explanations".

Map no 5. ^{1.5} ^{-3.5} ^{5.0} In red: mean daily max. temp.; in blue: mean daily min. temp.; in black: mean difference between daily max. and min. in those cases when both are available. For details, see "Explanations". The analysis refers to this mean difference.

Map no 6.

25 36 46
27 37

The figures indicate the mean cloudiness (unit: tenth of oktas) at 03 GMT (25), 09 GMT (27), 15 GMT (46) and 21 GMT (37) and, in blue, a mean value representing the working hours and computed as the arithmetic mean of the 09 and 15 GMT mean values. If, as in the case shown, this mean value, strictly speaking, is not a whole number, a choice is made between the two adjacent numbers by taking into account the mean value of the figures for 03 and 21 GMT. (If this rule is not sufficient to give preference to one of the two numbers, other rules are used, but would lead too far to quote them in full.)

The symbol placed at the location of each station represents the "blue" mean value; it is plotted according to the scheme applied for N in the synoptic code.

For two stations, Fagurhólsmýri and Hæll, the 15 GMT mean cloudiness is missing and no "blue" mean value computed. By a rough estimation it was nevertheless endeavoured to make a reasonable choice of symbol for these stations too.

Map no 7.

0.1
4

0.1 means that the average amount of precipitation in Reykjavík in December days referred to type 114 was 0.1 mm, and 4 means that this amounts to 4% of the mean amount of daily precipitation, the latter amount obtained by dividing the mean monthly precipitation (1931-60) by the number of days of the month concerned.

Map no 8.

27
7

27 means that on 27% of all December days referred to type 114 Reykjavík had a measureable amount of precipitation; 7 means that on 7% of the days the amount was ≥ 1.0 . The analysis refers to the latter percentage. The dots (meaning 0) represent: in the 'NE quadrant' the percentual number of days with ≥ 5.0 , and in the 'SE quadrant' the number of days with ≥ 10.0 mm of precipitation.

Supplementary information.

In writing the main text describing the various types (114, 115, ... 336) the author has tried to concentrate on such features which are clearly relevant from the viewpoint of medium-range forecasting. However, the tables obtained from the computer, a number of auxiliary tables prepared from them, and the maps accompanying the main text, all contain a good deal of information which may be useful from other points of view, as for instance for the purpose of special local forecasts, as an impulse to detailed climatological studies, and perhaps in relation to the scrutiny of observational records from individual stations. It was decided to arrange such information type by type but at the same time to break it out from the main text, from which references are given in special cases only. The supplement contains a number of tables and some comments, following a scheme which is briefly described below.

Nokkur orð um veðurlagsflokkun Hovmöllers

Danski veðurfræðingurinn Ernest Aabo Hovmöller (1912-2008) er nú langþekktastur fyrir sérstaka gerð veðurríta sem kennd eru við hann (Hovmöller, 1949).

Hann lauk magisterprófi í veðurfræði við Hafnarháskóla 1937 og starfaði síðan á dönsku veðurstofunni fram til ársins 1946. Þá flutti hann til Svíþjóðar, tók þar fil. lic. próf í fræðigrein sinni og gerðist deildarstjóri veðurfarsdeildar sænsku veðurstofunnar árið 1955.

Hovmöller starfaði síðan lengst af í Svíþjóð en dvaldi tvisvar við störf hér á landi. Í fyrria skiptið í þrjá og hálfan mánuð á árinu 1957 en síðar í þrjá mánuði vorið kalda 1979, en hann hafði farið á eftirlaun árið áður.

Í fyrri dvölinni var hann ráðgefandi fulltrúi Sameinuðu þjóðanna og leiðbeindi um starfsemi í veðurfarsdeild Veðurstofunnar (Veðráttan, ársyfirlit 1957). Einkum fjallaði hann um aðferðir til reikninga á meðaltölum veðurs. Árið 1960 gáfu Sameinuðu þjóðirnar út skýrslu hans um veðurfarsupplýsingar á Íslandi (Hovmöller, 1960). Nú, meir en hálfri öld síðar er það enn grundvallarit um veðurathuganir og meðaltalsreikninga.

Árið 1979 dvaldi Hovmöller hér öðru sinni og vann við að koma hugmynd sinni um veðurlagsflokkun fyrir Ísland í framkvæmd. Tókst það svo vel að aðferðir hans voru um nokkurra ára skeið notaðar á Veðurstofunni við gerð 3 til 5 daga veðurspáa. Hugmyndina hafði hann að einhverju leyti reynt áður í Svíþjóð upp úr 1960.

Veðurlagsflokkun

Það er alkunna að í suðlægum áttum er gjarnan þurrviðrasamt um norðaustanvert landið en oftast er þurrt suðvestanlands þegar vindur blæs af norðri. Býsna fróðlegt er að bera saman veður við svipuð skilyrði, t.d. athuga úrkomudreifingu á landinu annars vegar í hlýjum suðlægum áttum og hins vegar í dæmigerðum útsynningi. Hovmöller bjó til flokkunarkerfi sem nota má í þessu skyni.

Við veðurlagsflokkun Hovmöllers var eingöngu litið á veðurlag í 500 hPa-þrýstifletinum í námunda við landið en þessi þrýstiflötur er oftast í rúmlega 5 km hæð yfir landinu. Reiknaðar voru mælitölur fyrir styrk vestan- og sunnanátta í fletinum fyrir hvern einasta dag í tuttugu ár, 1958 til 1977. Að því loknu voru mánuðirnir skildir að.

Í janúarmánuðum þessara 20 ára eru alls 620 dagar. Þessum dögum var þvínæst skipt í þrennt: Hluta sem inniheldur þá 207 daga sem sterkasta vestanátt reyndust hafa í 500 hPa-fletinum, þá 207 daga sem vestanáttin var veikust og loks afganginn. Vestanáttinni í háloftunum var þannig skipt á þrjá flokka sem einfaldlega voru kallaðir 1, 2 og 3. Hæsta talan á við sterkustu vestanáttina, en talan 1 þá veikustu. Sams konar skipting var einnig gerð fyrir sunnanáttina.

Auk þess sem vindar eru mismiklir og hafa mismunandi stefnu í 500 hPa er mislangt upp í flötinn. Hæðinni var nú einnig skipt í þrjá flokka þannig að í fyrsta flokkinn koma þeir 207 dagar sem hafa hæstan 500 hPa-flöt o.s.frv. Þessir flokkar eru nefndir 4, 5 og 6 til aðgreingar

frá sunnan- og vestanþáttunum. Talan 4 stendur fyrir hæsta 500 hPa-þriðjungsflokkinn en 6 fyrir þann lægsta.

Á þennan hátt fást í janúarmánuði 27 flokkar og skipast allir dagar í flokk. Hver flokkur fær 3 stafa einkennistölu. Sem dæmi má nefna að í flokki 114 er vestanáttin veik (1), sunnanáttin líka (1) og 500 hPa-flöturinn stendur tiltölulega hátt (4). Í flokki 215 er vestanátt í meðallagi, sunnanátt veik og 500 hPa-hæðin er nærri meðallagi.

Hér ber að athuga að í flestum mánuðum er meðalvindátt í 500 hPa-fletinum af vestsuðvestri yfir Íslandi. Svo vill til að í allmörgum mánuðum eru skil milli sunnan- og norðanátt einmitt ekki fjarri mörkum flokkanna 1 og 2. Talan einn í sunnanáttarsætinu þýðir því að vindátt þann daginn hefur verið norðlæg í 500 hPa-fletinum. Allmargir dagar með raunverulega vestanátt eru hins vegar í flokki 1 í vestanáttarsætinu þótt vindátt sé af austri í meginhlutanum.

Hér er rétt að ítreka að samtals eru í öllum flokkum sem byrja á 1 (þ.e. 1xx) þriðjungur daga þess tímabils sem með er í athuginni.

Reikningur Hovmöllerþáttanna

Lítum nú á eitt háloftakort af svæði í kringum Ísland (mynd 1). Það sýnir jafnhæðarlínur 500 hPa-flatarins. Tölurnar sem standa víðsvegar um kortið eru settar við fimmta hvern breiddarbaug og tíunda hvern lengdarbaug sýna hæð flatarins í dekametrum (dam = 10 metrar). Í punktinum 65°N, 20°V er 500 hPa-flöturinn því í 5190 metra hæð¹.

Á kortinu má sjá að ákveðin suðvestanátt ríkir yfir landinu. Vindur blæs samsíða jafnhæðarlínunum og er því meiri eftir því sem línurnar eru þéttari. Hovmöller býr til mælitölur sem sýna vindátt, styrk og stefnu. Á mynd 1 sést að nokkrum punktum umhverfis landið hafa verið gefin nöfn frá p1 til p9.

Mál fyrir styrk vestanáttarinnar fæst með því að leggja saman hæðirnar í p7, p8 og p9 og draga samanlagða hæð í p1, p2 og p3 síðan frá. Styrkur sunnanáttarinnar fæst þá á sama hátt:

$$(p3 + p6 + p9) - (p1 + p4 + p7)$$

Mælieiningarnar köllum við H-einingar, eftir Hövmöller. Þennan dag (kl. 12) var styrkur vestanáttarinnar (ncep-greining), skammstafaður „A“ = 67 H, en styrkur sunnanáttarinnar, „B“ = 33 H og hæðin yfir miðju Íslandi (p5) var 535 dam. Sé flett upp í töflu þar sem flokkamörk þáttanna í einstökum mánuðum eru listuð má sjá að þessar tölur gefa flokkinn 334 (sterk vestanátt, sterk sunnanátt og hár 500 hPa-flötur).

Vinna Hovmöllers

Árið 1978 til 1979 var mikil vinna lögð í að lesa hæðir 500 hPa-flatarins í Hovmöllerpunktunum út úr útgefnum veðurkortum. Til þess var notað kortasafnið Täglicher Wetterbericht á árunum 1958 til 1977. Þvínæst voru flokkamörk reiknuð og dögum skipað í flokka. Meðalveður flokkanna 27 á 23 veðurstöðvum um land allt var reiknað og niðurstöður færðar á átta mismunandi kort fyrir hvern veðurflokk hvers mánaðar. Í upphafi voru sumarmánuðirnir júní, júlí og ágúst óflokkaðir en því lokið um 2 árum síðar.

¹ Rétt er að taka fram að hér er ekki um alveg heiðarlega metra að ræða heldur svokallaða þyngdarmættismetra (geopotential metres) þeir eru aðeins lengri en hefðbundnir metrar. Við þurfum þó ekki að gera okkur rellu út af því og tölum um hæðina eins og um venjulega metra væri að ræða.

Hovmöller skrifaði veðurlýsingu fyrir flokkana og skýrði einkenni þeirra. Allur textinn fylgir hér í viðhengi ásamt öllum kortum fyrir desember er hann hin fróðlegasta lesning. Strax kom í ljós að veður flokkanna greindist vel að í raunveruleikanum.

Notkun flokkunarinnar við veðurspár

Þegar Hovmöller kom hingað til lands 1979 komu hér í hús amerískar 5 daga sjávarmálsþrýstings- og 500 hPa hæðarspár, fimm daga handteiknuð veðurspá kom frá bresku veðurstofunni og þaðan kom einnig 24-stunda 500 hPa og þykktarspá. Allar þessar spár bárust á faxkortum. Auk þess komu hingað „punktar“, griddaðar amerískar veðurspár fyrir 500 hPa og sjávarmál, 24 og 48 stundir fram í tímann. Allar spárnar bárust tvisvar á dag. Breska sjávarmálsspáin þó fjórum sinnum á dag sólarhring fram í tímann ásamt greiningu.

Fljótlega var ráðist í að reyna hovmöllerkerfið á þessar spár. Fyrst þurfti að athuga hvort spárnar væru nothæfar og að því loknu varð að finna spánum heppilegt form til notkunar.

Veikleikar spáaðferðarinnar voru einkum tveir. i) Möguleikar á veðri eru mun fleiri en 27 í hverjum mánuði og reyndist dreifing bæði úrkomu og hita í hverjum flokki vera mikil. Þótt tölvuspárnar hittu á réttan hovmöllerflokk er veðrið oft ódæmigert fyrir flokkinn. Hins vegar stefna meðaltöl nokkurra daga sama flokks fljótt í eindregna átt. En suð reyndist mjög mikið. ii) Tölvuspárnar eru vitlausar.

Prófun á spánum varð því að vera tvíþætt. Annar vegar var athugað hvernig hita og úrkomu var spáð í Reykjavík og á Akureyri með því að nota flokka tölvuspárinnar en hins vegar var athugað hvernig tölvuspánum gekk að spá réttum flokki.

Strax kom í ljós að spá um hita með því að nota kortameðaltölin beint reyndist lítið betri heldur en sístöðuspá (persistens). Þá var reynt að spá hitabreytingum næstu 2 til 4 sólarhringa þannig að gengið var út frá meðalhita fyrsta dags („dagsins í dag“) og síðan spáð hlýnandi, kólnandi eða svipuðum hita. Miðað var við að ef hiti átti að vera meir en 2 stigum hærra þegar spáin gilti heldur en „nú“ var spáð hlýnandi, kólnandi var spáð á sama hátt.

Þetta gekk allvel fyrir Reykjavík, spárnar fyrir dagana þrjá reyndust „réttar“ í um það bil 2 tilvikum af 3 meðan sístöðuspá var rétt í um 40% tilvika miðað við tveggja sólarhringa spá. Þetta gekk líka vel fyrir Akureyri, en þar var sístöðuspá rétt í um 30% tilvika. Álíka gekk með 3 og 4 sólarhringa.

Frekari prófanir verða ekki raktar hér en hovmölleraðferðin hefur trúlega gert 3 til 4 daga veðurspár mögulegar á árunum upp úr 1980. Haustið 1982 varð bylting í veðurspám í hér á landi og víðar þegar spár ECMWF urðu aðgengilegar og bæði breska og bandaríska veðurstofan bættu líkön sín umtalsvert.

Hér var um hríð fylgst með flokkahittni bandarísku spánna og spáa reiknimiðstöðvarinnar. Fljótlega kom í ljós að sú síðarnefnda hafði um eins dags forskot á gæði 4 og 5 daga spáa umfram hina. Sömuleiðis kom í ljós að hittni reiknimiðstöðvarinnar tók árlegum framförum og gæðin fóru fram úr tölfræðilegum spám á við hovmölleraðferðina sem þar með varð fljótt úrelt [sem 3 til 5 daga spá] og hvarf alveg úr notkun eftir miðjan níunda áratuginn. Um það leyti var einnig farið að reyna að spá hita út frá þykkt og gaf sú aðferð almennt betri árangur heldur en spár sem notuðu hovmöllerkortin beint.

Önnur notkun hovmöllergreiningar

Þrátt fyrir að greiningaraðferð Hovmöllers hafi fljótt orðið úrelt [miðað við upphaflega ætlaða notkun] er hún mjög gagnleg sem mælikvarði á breytileika veðurs og veðurfars, jafnvel til lengri tíma. Þetta á frekar við um mælipættina þrjá heldur en flokkunina. Um 1990 var farið að „endurgreina“ veður aftur í tímann með tölvureikningum. Fram að því hafði öll greining á eldra veðri byggst á notkun handteiknaðra korta eða þá mjög frumstæðum tölvugreiningum.

Verkefni voru sett í gang beggja vegna Atlantshafs, fyrst svokallað ncep-verkefni sem endurgreindi veður árána frá 1958 (alþjóðajarðeðlisfræðiárið). Niðurstöður voru formlega birtar árið 1996 (Kalnay og félagar). Reiknimiðstöð evrópuveðurstofa tók einnig til við endurgreiningar, sú fyrsta tók til 15 ára (ERA15), en síðan var farið aftur til 1958 og veður árána fram til 2002 greint á nákvæmari hátt en í ncep-verkefninu undir verkefnisheitinu ERA40.

Gögn úr ncep-greiningunni bárust hingað til lands 1998 í tengslum við fjölþjóðleg rannsóknarverkefni sem evrópusambandið styrkti. Þá var hovmöllerflokkunin endurtekin og lauslega borin saman við fyrri flokkun. Í heild breyttust flokkamörk lítið og erfitt reyndist að tengja veðurfarsbreytingar árána 40 beint við flokkana, ef til vill eru þeir of margir.

Hins vegar kom hið breytilega veðurfar mjög vel fram í hovmöllermælitölunum sjálfum og gat breytileiki þeirra „skýrt“ út stóran þátt veðursveiflna þessa tímabils. Eftirliti með hovmöllertölunum og þáttarúmi þeirra hefur verið haldið áfram síðan og hafa fáein erindi verið flutt um það eftirlit á þingum Veðurfræðifélagsins á undanförunum árum.

Nokkur grein er gerð fyrir vinnu á þessu sviði í greinargerðinni *Regional Climate and Simple Circulation Parameters* sem út fyrst 1993 og í annarri prentun 1997. Síðari prentunin er aðgengileg á vef Veðurstofunnar:

<http://www.vedur.is/media/vedurstofan/utgafa/greinargerdir/1997/RegionalClimate.pdf>

Þar er meðal annars gerð grein fyrir samskonar þáttagreiningu fyrir 1000 hPa-flötinn og 500/1000 hPa-þykktarflötinn yfir Íslandi, auk greiningu ársþátta yfir Grænlandi, Suður-Noregi, Svalbarða og Finnlandi.

Hovmöller, E. (1949), The Trough-and-Ridge diagram. *Tellus*, 1: 62–66. doi: 10.1111/j.2153-3490.1949.tb01260.x

Viðhengi:

Flokkalýsing Hovmöllers

Flokkakort júlí og desembermánaða