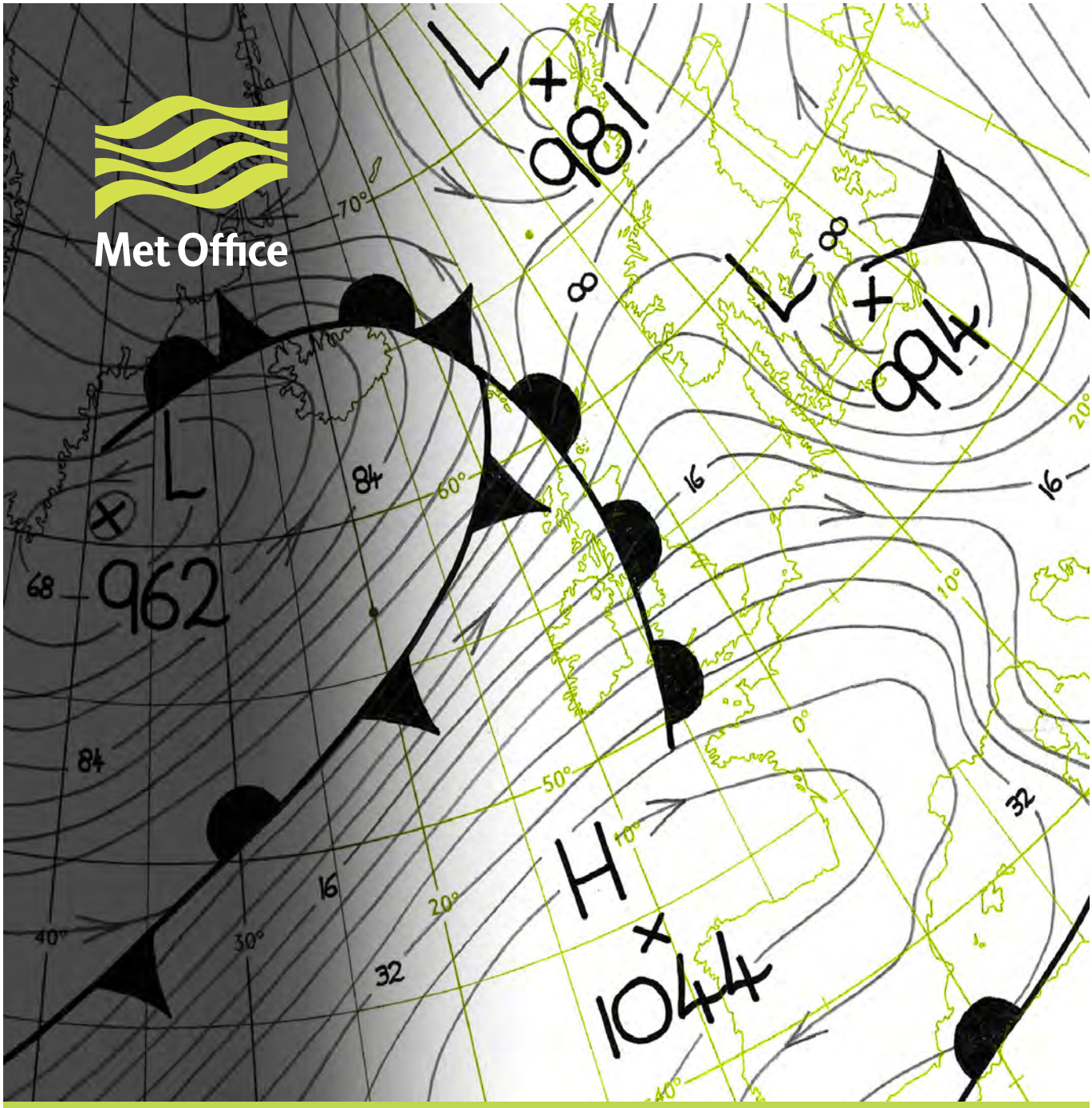

Weather charts

National Meteorological Library and Archive
Factsheet 11 — Interpreting weather charts

The National Meteorological Library and Archive

Open to everyone

The library was first mentioned in the 1870 Annual Report of the Meteorological Office.

In 1914 the archive was established as the official custodian of meteorological related records. It holds historic weather records on behalf of the nation and is an approved place of deposit under the Public Records Act.

The National Meteorological Library and Archive is a National Archive (TNA) Accredited Service.

The National Meteorological Library and Archive are open by appointment.

All of the images used in this fact sheet along with many others covering all aspects of meteorology can be obtained from the National Meteorological Library and Archive. For further information including our opening times please visit our web page at https://www.metoffice.gov.uk/research/library-and-archive
or email: metlib@metoffice.gov.uk

The other factsheets in this series are available to view at the following web page
https://www.metoffice.gov.uk/research/library-and-archive/publications/factsheets

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Introduction

Sir Francis Galton is credited with producing the first modern weather map in 1875 showing areas of similar atmospheric pressure. Charts showing isobars are useful because they identify features such as anticyclones (areas of high pressure), depressions (areas of low pressure), troughs and ridges which are associated with particular kinds of weather.

High pressure or anticyclone

High pressure or anticyclone is that atmospheric pressure distribution in which there is a high central pressure relative to the surroundings. It is characterised on a synoptic chart by a system of closed isobars, generally approximately circular or oval in form, enclosing the central high pressure.

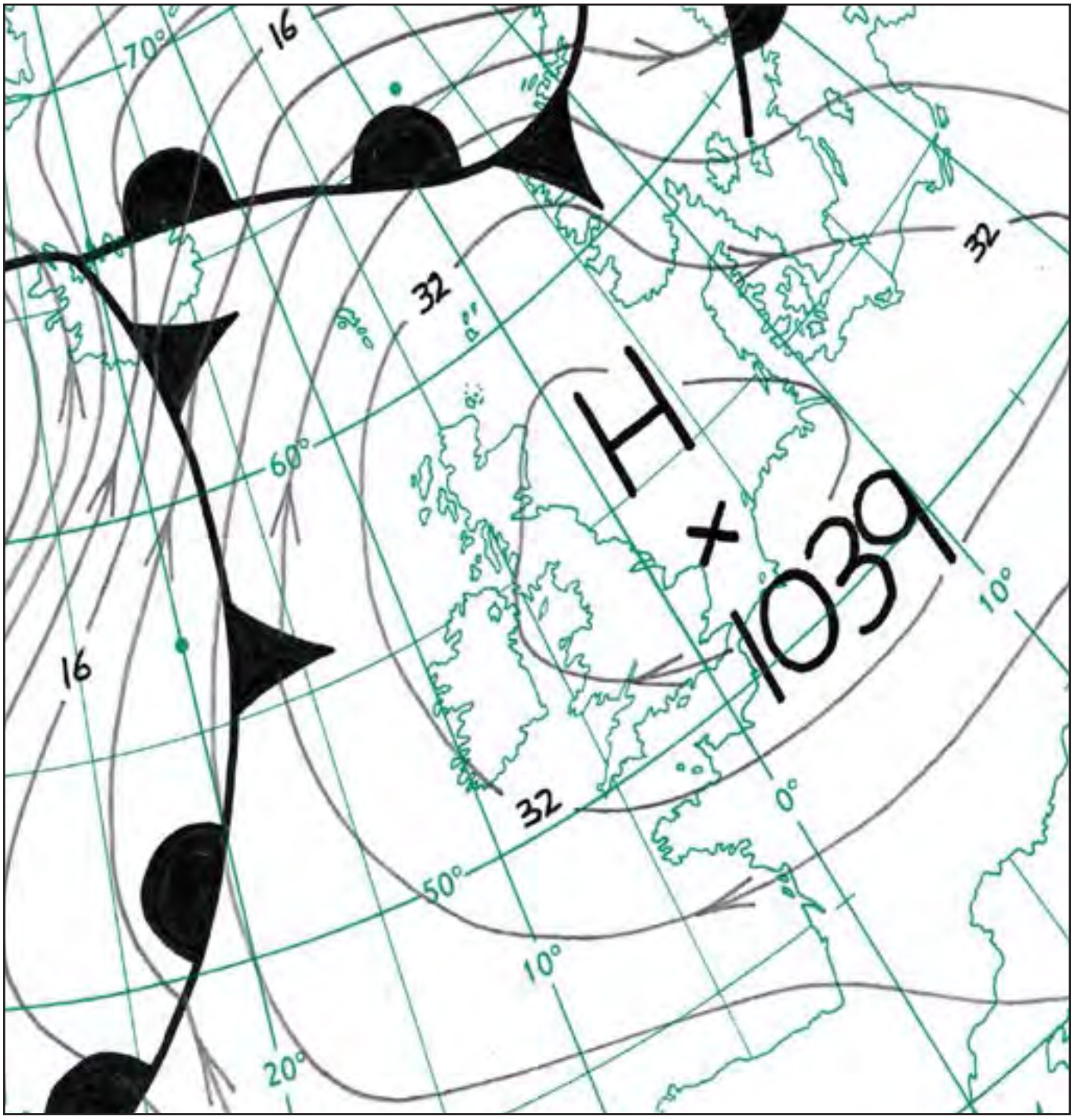


Figure 1. Anticyclone centred off the east coast of the United Kingdom at 1200 GMT on 26 March 2012.

Sir Francis Galton also devised the term ‘anticyclone’ in 1861 as implying the possession of characteristics opposite to those found in the cyclone or depression. Thus, the circulation about the centre of an anticyclone is clockwise in the northern hemisphere (anticlockwise in the southern), and the weather is generally quiet and settled.

Warm and cold anticyclones

There are two main contrasting types of anticyclone, ‘warm’, and ‘cold’. A warm anticyclone has its origins in the sub-tropical parts of the world, usually around 30-35 °N. A typical example of a warm anticyclone that affects the United Kingdom is the Azores High. A cold anticyclone has its origins in the sub-arctic parts of the world. A typical example of a cold anticyclone is the Siberian High which develops over the northern Russia during the winter months and can bring cold easterly winds across the United Kingdom.

Blocking highs

High pressures have the ability to interrupt the normal eastward movement of depressions, troughs and ridges for at least a few days. These are called blocking highs and are typical of high pressure centres that remain fixed in a particular location for days or even weeks on end. There is a tendency for blocking highs to persist in preferred geographical areas, especially between 10 and 20 degrees West, just to the west of the United Kingdom, and between 10 and 20 degrees East, over Scandinavia.

Ridge of high pressure

A ridge (of high pressure), also termed a Wedge, is an extension of an anticyclone or high-pressure area shown on a synoptic chart and is generally associated with fine, anticyclonic-type weather.

Low pressure or depression

In a depression (also referred to as a ‘low’), air is rising. As it rises and cools, water vapour condenses to form clouds and perhaps precipitation. Consequently, the weather in a depression is often cloudy, wet and windy (with winds blowing in an anticlockwise direction around the depression). There are usually frontal systems associated with depressions.

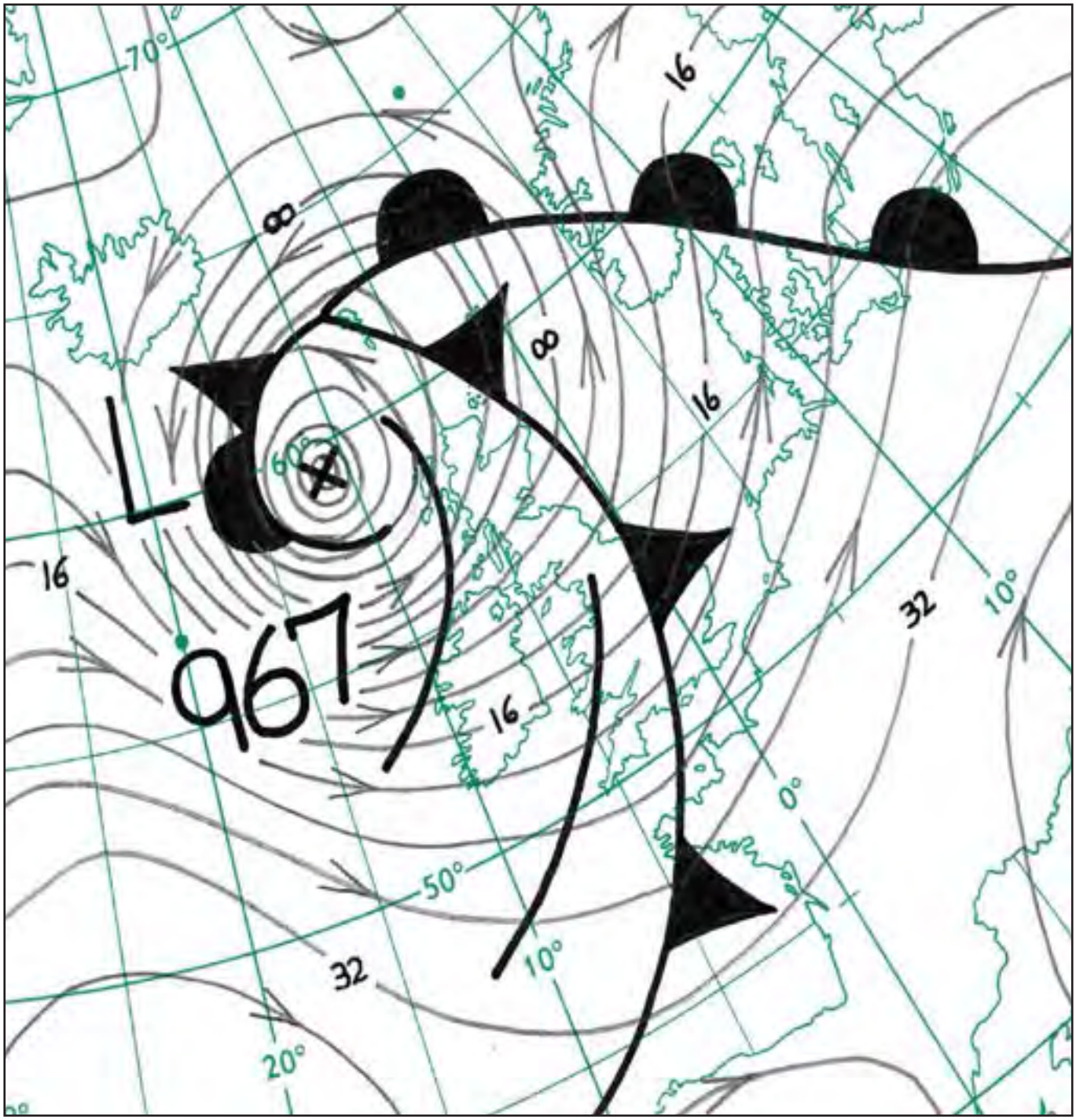


Figure 2. A depression centred to the northwest of the United Kingdom at 0600 GMT on 28 December 2011.

Trough of low pressure

A trough (of low pressure) is a pressure feature of the synoptic chart; it is characterised by a system of isobars which are concave towards a depression and have maximum curvature along the axis of the trough, or 'trough line'.

A front is necessarily marked by a trough but the converse is not true. Those troughs which are not frontal in character are, however, also generally marked by cloudy, showery weather.

Buys Ballot's Law

A rule in synoptic meteorology, enunciated in 1857 by Buys Ballot, of Utrecht, which states that if, in the northern hemisphere, one stands with one's back to the wind, pressure is lower on one's left hand than on one's right, whilst in the southern hemisphere the converse is true. This law implies that, in the northern hemisphere, the winds blow anticlockwise round a depression, and clockwise round an anticyclone; the converse is true in the southern hemisphere.

Isobars (lines of equal atmospheric pressure)

The lines shown on a weather map are isobars — they join points of equal atmospheric pressure. The term isobar comes from the Greek isos meaning 'equal' and baros meaning 'weight'.

Atmospheric pressure is measured by a barometer, with a correction then being made to give the equivalent pressure at mean sea-level. Meteorologists measure pressure in units called hectoPascals (hPa) although the millibar (mb) is still widely used. Older instruments sometimes give pressure in terms of inches of mercury (in Hg).

The general conversion for units of atmospheric pressure are:

1 in Hg = 33.864 hPa

In the British Isles the average sea-level pressure is about 1013.25 mb (about 30 inches of mercury), and it is rare for pressure to rise above 1050 mb or fall below 950 mb.

Charts showing isobars are useful because they identify features such as anticyclones and ridges (areas of high pressure) and depressions and troughs (areas of low pressure), which are associated with particular kinds of weather. These features move essentially in a predictable way.

Also, wind speeds and directions are related to the spacing and orientation of the isobars.

Relationship between isobars and wind:

There are two important relationships between isobars and winds:

- The closer the isobars, the stronger the wind.
- The wind blows almost parallel to the isobars.

These make it possible to deduce the wind flow from the isobars.

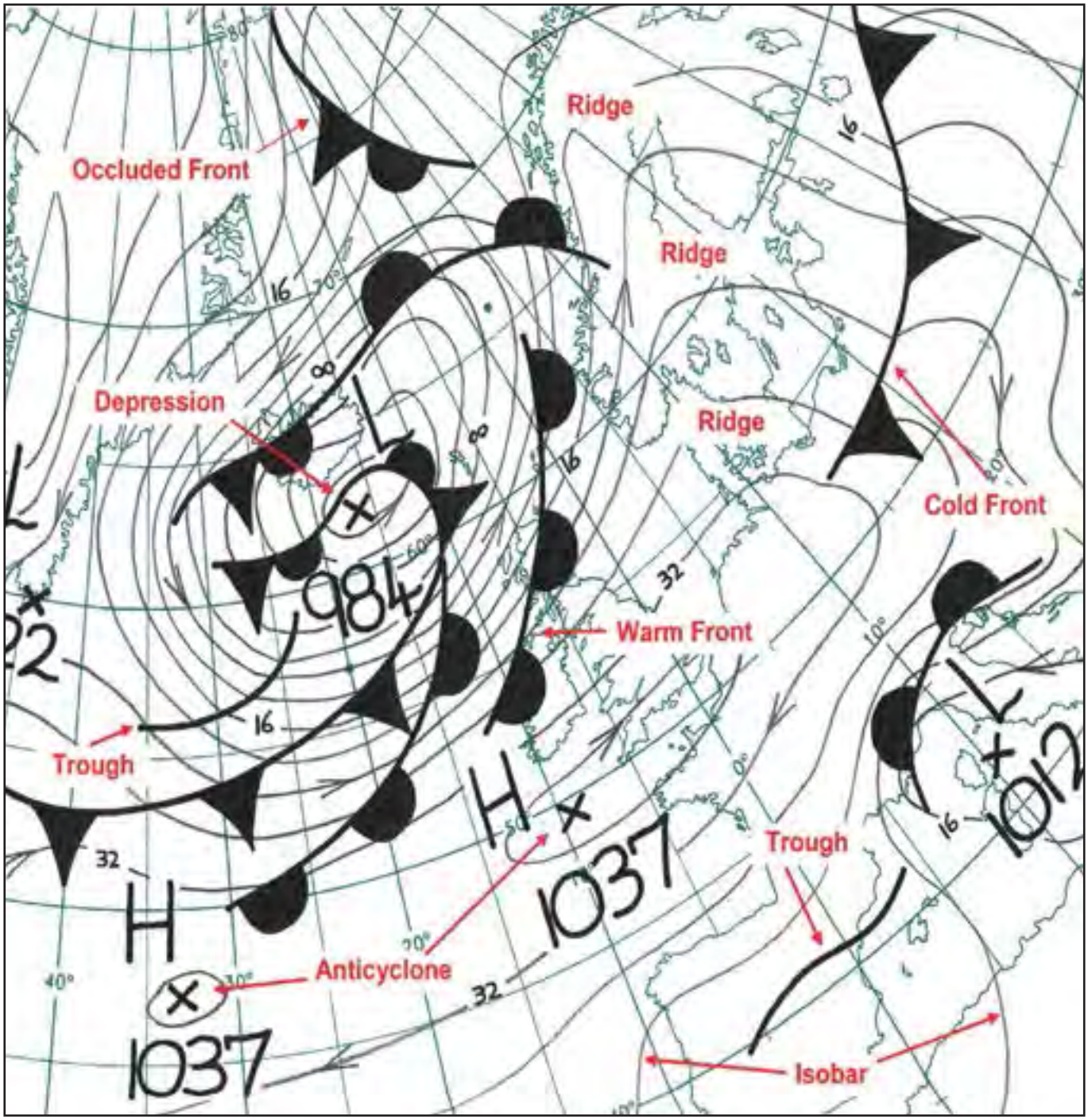


Figure 3. The association between depressions, anticyclones, isobars, troughs, ridges and weather fronts.

Wind speed and direction

The direction given for the wind refers to the direction from which it comes. For example, a westerly wind is blowing *from* the west towards the east.

Measurements of wind strength are made at 10 metres (33 feet) above the ground. A specified height has to be used because the wind speed decreases towards the ground. In the United Kingdom winds are measured in knots (nautical miles per hour).

However, forecast winds are often given in miles per hour (where 1 knot is equivalent to 1.15 mph) or in terms of the Beaufort Scale. Rapid variations in wind speed are referred to as gusts. Gusts are higher inland than over the sea or windward coasts, although the mean wind speeds tend to be lower inland. Typically, gusts can be 60% higher than the mean speed, although in the middle of cities this can reach 100%. Northerly winds tend to be gustier than southerly ones.

Relationship between wind direction and weather

In general, the weather is strongly influenced by the wind direction, so information about the wind provides an indication of the type of weather likely to be experienced. However, this approach is effective only if the wind is blowing from the same direction for some time. A marked change in wind direction usually indicates a change in the weather.

Northerly winds tend to bring relatively cold air from Polar Regions to the British Isles. Similarly, southerly winds tend to bring relatively warm air from the tropics. The characteristics of the air are also affected by its approach to the British Isles. Air picks up moisture if it travels across the sea, but remains relatively dry if it comes across the land.

As cold polar air moves southwards over an increasingly warm sea, the heating of the air by the sea causes cumulus clouds to form. These clouds may grow sufficiently for showers to develop and, consequently, winds from the north-west, north or north-east usually bring cold, showery weather to the British Isles.

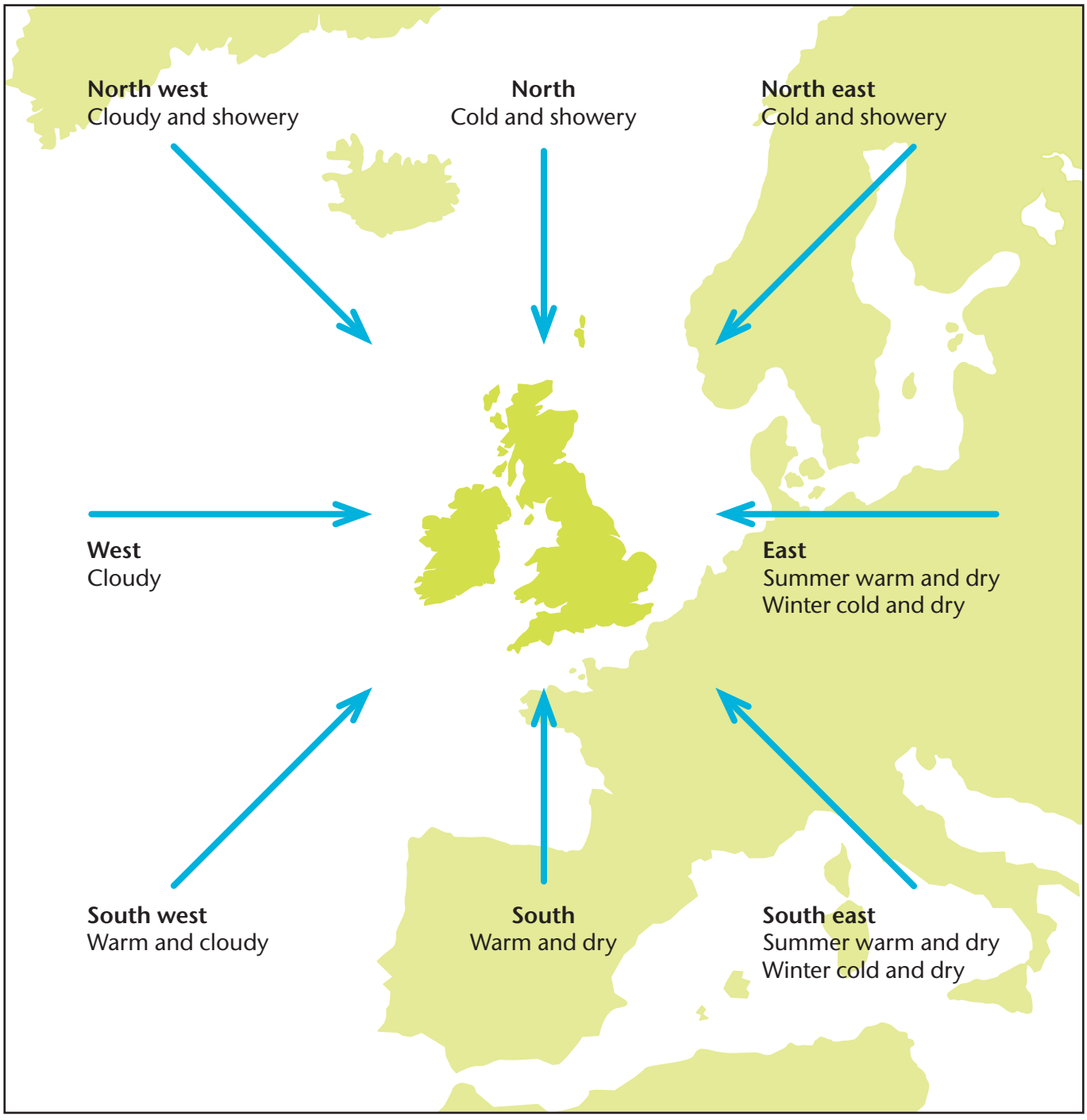


Figure 4. Chart showing the characteristic weather phenomena associated with winds affecting the British Isles from various directions.

Warm air from the tropics moving northwards over the sea is cooled from below. Sometimes the cooling is sufficient for sea fog or a thin layer of stratus to form. The cloud can become thick enough for drizzle, especially on windward coasts and over high ground. In general, winds from the west or south-west are associated with overcast, wet weather.

Winds from the south and south-east mainly occur in summer and these bring warm, dry weather. However, southerly winds can sometimes bring hot, thundery weather.

Easterly winds in winter bring very cold air to the British Isles. The characteristics and path of the air determine whether it is cloudy (with perhaps rain, sleet or snow) or fine and sunny. In summer, an easterly wind will mean it is cool on the east coast but warm elsewhere, usually with clear skies.

Warm, cold and occluded fronts

The boundary between two different types of air mass is called a front. In our latitudes a front usually separates warm, moist air from the tropics and cold, relatively dry air from Polar Regions. On a weather chart, the round (warm front) or pointed (cold front) symbols on the front point in the direction of the front's movement. Fronts move with the wind, so they usually travel from the west to the east. At a front, the heavier cold air undercuts the less dense warm air, causing the warm air to rise over the wedge of cold air.

As the air rises there is cooling and condensation, thus leading to the formation of clouds. If the cloud becomes sufficiently thick, rain will form. Consequently, fronts tend to be associated with cloud and rain. In winter, there can be sleet or snow if the temperature near the ground is close to freezing. It is convenient to distinguish between warm fronts, cold fronts and occluded fronts.

A front which is moving in such a way that the warm air is advancing to replace the cold air is called a warm front. As the warm front approaches, there is thickening cloud and eventually it starts to rain. The belt of rain extends 100 — 200 miles ahead of the front. Behind the front the rain usually becomes lighter, or ceases, but it remains cloudy. As a warm front passes, the air changes from being fairly cold and cloudy to being warm and overcast (typical of warm air from the tropics travelling over the sea). Also there is a clockwise change in wind direction, and the wind is said to 'veer'.

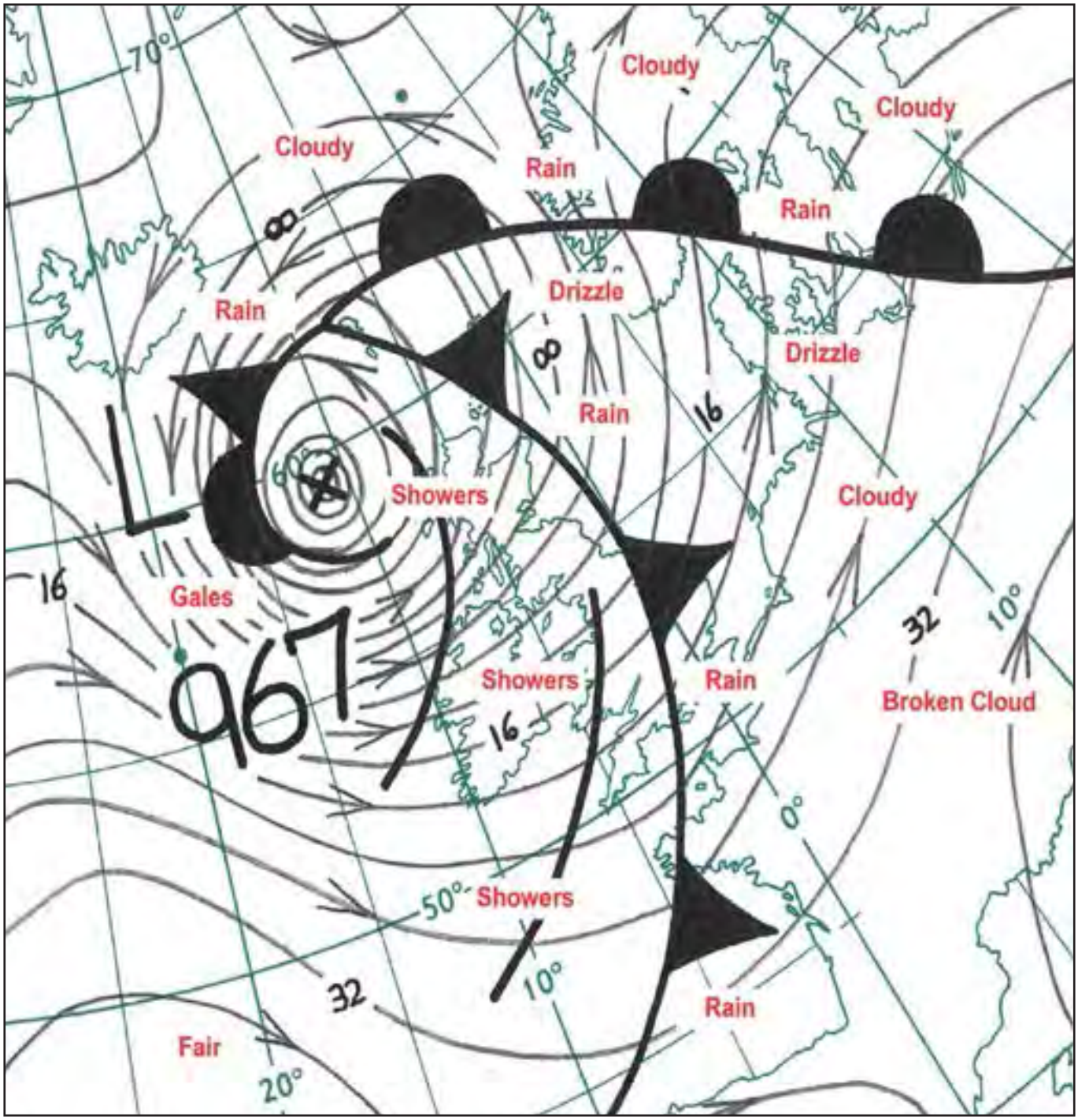


Figure 5. Weather associated with a depression

A **cold front** moves so that the cold air is advancing to replace the warm air. This means that as a cold front passes, the weather changes from being mild and overcast to being cold and bright, possibly with showers (typical of cold polar air travelling over the sea). The passage of the front is often marked by a narrow band of rain and a veer in the wind direction.

An **occluded front** can be thought of as being a result of the warm and cold fronts meeting. Consequently, ahead of an occlusion the weather is similar to that ahead of a warm front, whereas behind the occlusion it is similar to that behind a cold front.

The characteristics given for the fronts apply to active fronts. If the front is weak, the rain associated with it is light or non-existent, and the changes across the front are less marked.

Satellite imagery used to interpret weather charts

Satellite pictures are an invaluable tool for weather forecasters, and the various types of images that are now widely available can significantly enhance the understanding of meteorological processes and weather forecasting, especially the movement of weather systems. Figures 6 and 7 show how valuable satellite imagery is to synoptic weather forecasting.

Figure 6. Visible satellite image showing a depression to the west of Scotland at 1200 UTC on 11 November 2010.

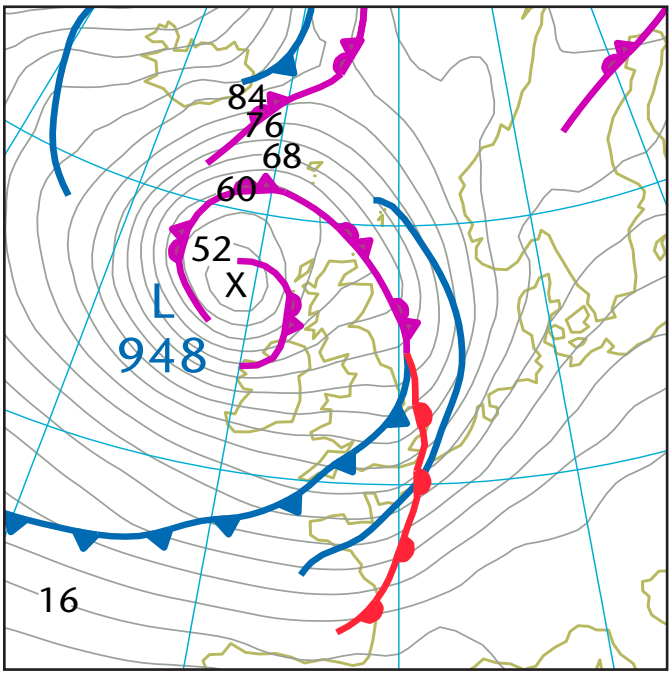


Figure 7. Surface synoptic chart showing the same depression to the west of Scotland at 1200 UTC on 11 November 2010.

Figure 6 is a visible image taken at 1200 UTC on 11 November 2010 when a deep depression swept across the North Atlantic towards the British Isles. This image shows a deep and well developed area of low pressure centred to the west of Scotland. The image shows clearly the cloud structure swirling around the centre of the low with the main frontal cloud clearing the east coast of the UK and shower clouds following on behind. The main frontal zone can be seen running down the North Sea and into France and the Low Countries. Heavy and blustery showers behind the main frontal band are running into many western areas of the UK, merging at times into longer spells of rain. Also, clearly seen to the bottom right of this image are the Alps covered in snow.

Figure 7 is the surface synoptic chart for 1200 UTC on 11 November 2010 showing a deep area of low pressure with a central pressure value of 948 hPa to the west of Scotland. Wrapped around the low pressure centre is an occluded front with a cold front lying roughly from Lincolnshire across the Midlands and down to the West Country. The warm front is just clearing the east coast of southeast England with much of southern England and East Anglia lying in the warm sector of this depression. Also running into western Scotland is an old occluded front which only enhances the showery activity in that part of the UK. A weak ridge of high pressure is lying across southern France, giving a lot of fine weather here and across northern Italy.

A more detailed analysis of air masses and weather fronts can be found in fact-sheet number 10 in this series.

Decoding weather charts and weather summaries

Good quality observations are one of the basic 'tools of the trade' for a weather forecaster. On a meteorological synoptic chart, the weather conditions at a given observing site are represented on this chart by a station circle plot.

The weather conditions at each individual station can be represented on a surface chart by means of a station circle or triangle plot. The land station plot can represent all the elements reported from that station, typically examples are:

- Air (dry-bulb) temperature
- Dewpoint temperature
- Atmospheric pressure (reduced to mean sea level)
- Pressure tendency (observed over the last three hours)
- Total cloud amount
- Amount, type and height of cloud
- Current weather
- Past weather
- Wind direction
- Wind speed
- Maximum gust speed
- Visibility

In addition to the above elements, stations at sea, such as ships or buoys, also report:

- Sea surface temperature
- Wave height
- Wave direction
- Swell height
- Swell direction
- Movement of ship or buoy

Decode and example of a land station plot

Each element of the observation, with the exception of wind, is plotted in a fixed position around the station circle so that individual elements can be easily identified.

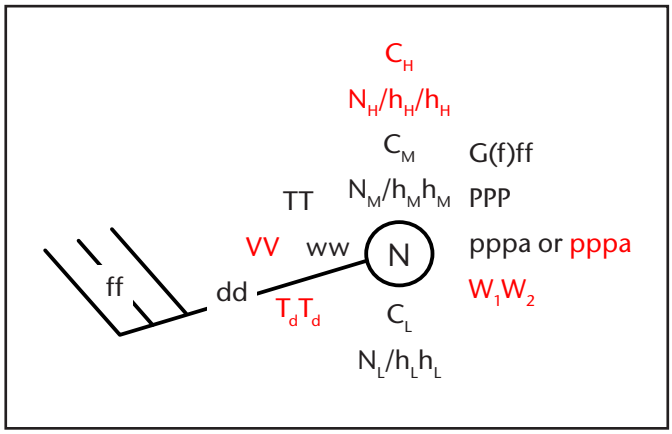


Figure 9. Decode of elements plotted on a land station circle (note the colour coding).

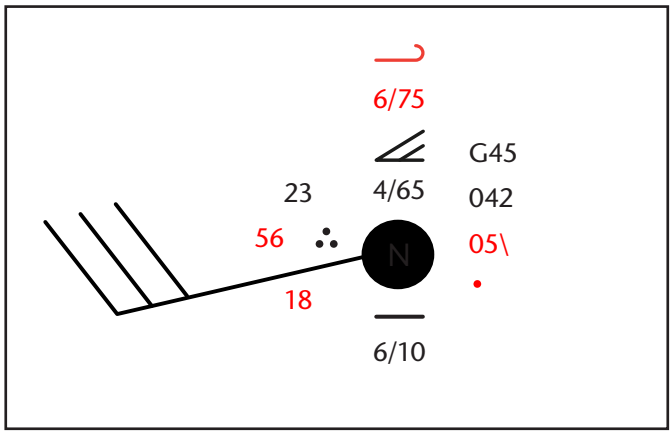


Figure 10. Example of a standard land station circle plot.

Identifier (From Figure 9)	Description	Actual (From Figure 10)
N	Total amount of cloud (in oktas)	8
C_L	Type of low cloud	Stratus
N_L	Amount of low cloud (in oktas)	6
h_Lh_L	Height of low cloud (in feet)	1,000
C_M	Type of medium cloud	Altostratus
N_M	Amount of medium cloud (in oktas)	4
h_Mh_M	Height of medium cloud (in feet)	15,000
C_H	Type of high cloud	Cirrus
N_H	Amount of high cloud (in oktas)	6
h_Hh_H	Height of high cloud (in feet)	25000
TT	Dry-bulb air temperature (in degrees Celsius)	23
T_dT_d	Dew point temperature (in degrees Celsius)	18
ww	Present weather	Continuous moderate rain
W_1W_2	Past weather	Rain
dd	Wind direction (in degrees)	250
ff	Wind speed (in knots)	30
G(f')f'f'	Maximum wind gust (in knots)	45
VV	Visibility (in metres or kilometres)	6,000 metres
pppa or pppa	Pressure tendency and trend (black: rising, red: falling) (in millibars)	Falling 0.5 hPa in last 3 hours
PPP	Atmospheric pressure (in hPa)	1004.2

Table 1. Decode of elements plotted on a land station circle from the example in Figure 10.

Decode and example of a ship station plot

Each element of the observation, with the exception of wind, is plotted in a fixed position around the station circle so that individual elements can be easily identified.

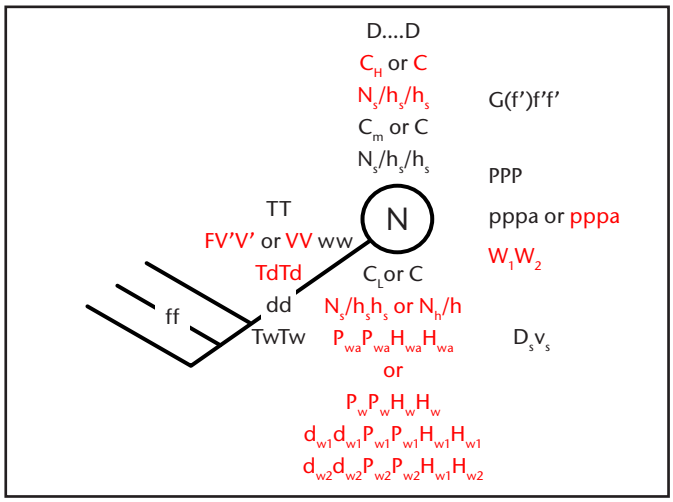


Figure 11. Decode of elements plotted on a ship station circle (note the colour coding).

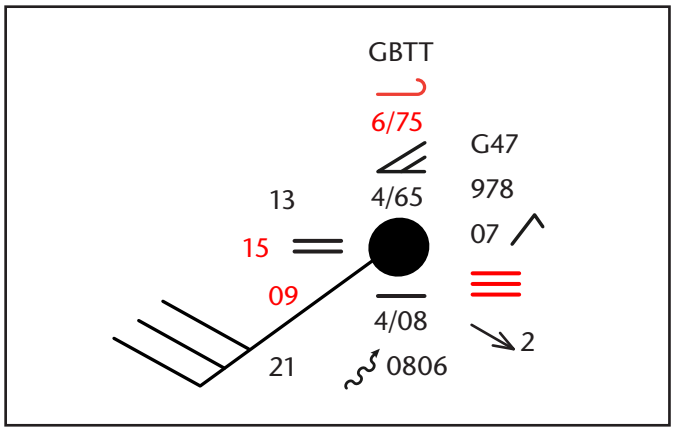


Figure 12. Example of a standard ship station circle plot.

Identifier (From Figure 11)	Description	Actual (From Figure 12)
N	Total amount of cloud (in oktas)	8 oktas
C_L	Type of low cloud	Stratus
N_L	Amount of low cloud (in oktas)	4
h_Lh_L	Height of low cloud (in feet)	800
C_M	Type of medium cloud	Altostratus
N_M	Amount of medium cloud (in oktas)	4
h_Mh_M	Height of medium cloud (in feet)	15,000
C_H	Type of high cloud	Cirrus
N_H	Amount of high cloud (in oktas)	6
h_Hh_H	Height of high cloud (in feet)	25,000
TT	Dry-bulb air temperature (in degrees Celsius)	13
T_dT_d	Dew point temperature (in degrees Celsius)	9
T_WT_W	Sea surface temperature	21
ww	Present weather	Mist
W_1W_2	Past weather	Fog
dd	Wind direction (in degrees)	240
ff	Wind speed (in knots)	30
G(f')f'f'	Maximum wind gust (in knots)	47
FV'V' or VV	Visibility (in metres or kilometres)	1,500 metres
pppa or pppa	Pressure tendency and trend (black: rising, red: falling) (in millibars)	Rising then falling - 0.7 hPa higher than 3 hours ago
PPP	Atmospheric pressure (in hPa)	997.8
D_SV_S	Ship's course and speed over the last 3 hours	Moving SE at 6 to 10 knots
$P_{wa}P_{wa}H_{wa}H_{wa}$	Period of waves (in seconds) Height of waves (in ½ metres)	-
$P_WP_WH_WH_W$	Period of sea waves (in seconds) Height of sea waves (in ½ metres)	-
$d_{w1}d_{w1}P_{w1}P_{w1}H_{w1}H_{w1}$	Direction, in tens of degrees, from which the first swell waves are coming. Period of first swell waves (in seconds) Height of first swell waves (in ½ metres)	Swell waves coming from the southwest. 3 metres every 8 seconds
$d_{w2}d_{w2}P_{w2}P_{w2}H_{w2}H_{w2}$	Direction, in tens of degrees, from which the second swell waves are coming. Period of second swell waves (in seconds) Height of second swell waves (in ½ metres)	-
D....D	Ship's call sign	GBTT (Call sign of the QE2)

Table 2. Decode of elements plotted on a ship station circle from the example in Figure 12.

Decode and example of a METAR (METeorological Aerodrome Report) station plot

Each element of the observation, with the exception of wind, is plotted in a fixed position around the station circle so that individual elements can be easily identified.

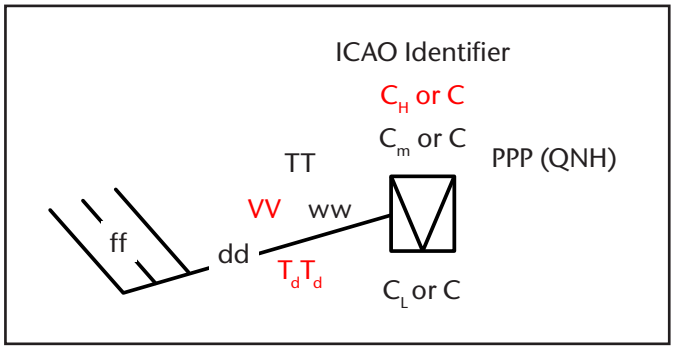


Figure 13. Decode of elements plotted on a METAR station circle (note the colour coding).

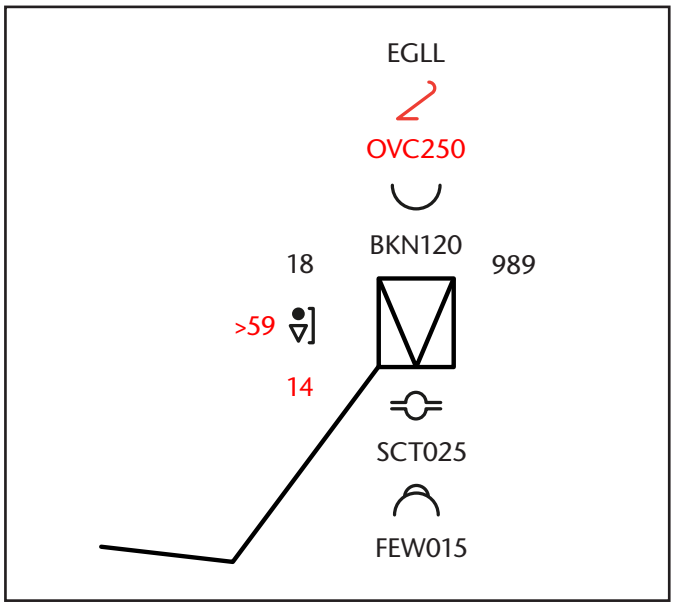


Figure 14. Example of an older type of METAR station circle plot.

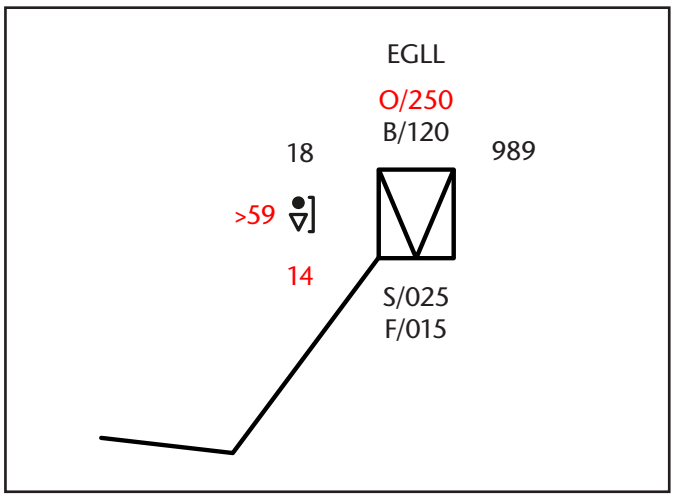


Figure 15. Example of a newer type of METAR station circle plot.

Identifier (From Figure 13)	Description	Actual (From Figure 13)
C_L or C	Amount/Type/Height of low cloud	3-4 oktas of stratocumulus cloud at 2,500 feet plus 1-2 oktas of Cumulus cloud at 1,500 feet
C_M or C	Amount/Type/Height of medium cloud	5-7 oktas of altocumulus cloud at 12,000 feet
C_H or C	Amount/Type/Height of high cloud	Overcast layer of cirrostratus cloud at 25,000 feet.
TT	Dry-bulb air temperature (in whole degrees Celsius)	18
T_dT_d	Dewpoint temperature (in whole degrees Celsius)	14
ww	Present weather	Recent rain shower(s)
VVVV	Visibility (in metres or kilometres)	Greater than 9 km
PPP	Atmospheric pressure adjusted to mean sea level (in hPa)	998.9
dd	Wind direction (in degrees)	200
ff	Wind speed (in knots)	10
ICAO Identifiers can be found in the ICAO Location Indicators Handbook (Doc 7910/100)		

Table 3. Decode of elements plotted on a METAR station circle from the examples in Figure 14 and Figure 15.

Decode of elements that make up the station circle plot

Cloud cover (N)

The total amount of the sky covered by cloud is expressed in oktas (eighths) and plotted within the station circle itself. The symbols used over the years for manned stations are as follows:

Before 1914

No symbols were used, but the Beaufort letter for the amount of cloud was plotted instead.

Beaufort letters	Description
b	Total cloud amount 0 to 2 oktas
bc	Total cloud amount 3 to 5 oktas
c	Total cloud amount 6 to 7 oktas
o	Uniform thick layer of cloud completely covering the sky (overcast)

Figure 16. Beaufort letters used to describe the total amount of cloud present.

1 January 1914 to 31 December 1949

Symbol	Description	Symbol	Description
	Sky clear (0 oktas)		5–6 oktas covered
	1–2 oktas covered		7–8 oktas covered
	3–4 oktas covered		

Figure 17. Symbols used to describe the total amount of cloud present during the period from January 1914 to December 1949.

1 January 1950 to 30 June 1968

Symbol	Description	Symbol	Description
	Sky clear (0 oktas)		5 oktas covered
	1 okta covered		6 oktas covered
	2 oktas covered		7 oktas covered
	3 oktas covered		Overcast sky 8 oktas
	4 oktas covered		Sky obscured

Figure 18. Symbols used to describe the total amount of cloud present during the period from January 1950 to June 1968.

1 July 1968 to the present

Symbol	Description	Symbol	Description
	Sky clear (0 oktas)		6 oktas covered
	1 okta or less of sky covered but not zero		7 oktas covered
	2 oktas of sky covered		8 oktas covered
	3 oktas of sky covered		Sky obscured by fog or other meteorological phenomena
	4 oktas of sky covered		Cloud cover obscured for other reasons or not observed
	5 oktas of sky covered		

Figure 19. Symbols used to describe the total amount of cloud present during the period from July 1968 to the present.

Increasingly, automatic weather observations are being plotted on today's charts. To differentiate between a manned observation and an observation done automatically, a triangle is used instead of the station circle. The station triangle is filled in according to the total amount of cloud observed at the station and can be represented as follows:

Symbol	Description	Symbol	Description
	Sky clear (0 oktas)		6 oktas covered
	1 okta or less of sky covered, but not zero		7 oktas covered
	2 oktas of sky covered		8 oktas covered
	3 oktas of sky covered		No cloud data
	4 oktas of sky covered		Station plotted when a METAR (METeorological Aerodrome Report) is reported–no total cloud information is provided
	5 oktas of sky covered		

Figure 20. Symbols used to describe the total amount of cloud present as reported by automatic weather stations and stations reporting using the METAR code.

Cloud amount decode for METARs

SKC or CLR: 0 oktas

FEW: 1 to 2 oktas

SCT: 3 to 4 oktas

BKN: 5 to 7 oktas

OVC: 8 oktas

Cloud Types (C_L, C_M, C_H)

Cloud symbols used on a synoptic chart for low cloud (C_L)

C_L = stratocumulus (Sc), stratus (St), cumulus (Cu) and cumulonimbus (Cb)

Symbol	Code figure	Description
	0	No stratocumulus, stratus, cumulus or cumulonimbus
	1	Cumulus with little vertical extent and seemingly flattened, or ragged cumulus other than of bad weather#, or both
	2	Cumulus of moderate or strong vertical extent, generally with protuberances in the form of domes or towers, either accompanied or not by other cumulus or by stratocumulus, all having their bases at the same level
	3	Cumulonimbus, the summits of which, at least partially, lack sharp outlines, but are neither clearly fibrous (cirriform) nor in the form of an anvil; cumulus, stratocumulus or stratus may also be present
	4	Stratocumulus formed by the spreading out of cumulus, cumulus may also be present
	5	Stratocumulus not resulting from the spreading out of cumulus
	6	Stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but not stratus fractus of bad weather#
	7	Stratus fractus of bad weather# or cumulus fractus of bad weather#, or both (pannus), usually below altostratus or nimbostratus
	8	Cumulus and stratocumulus other than that formed from the spreading of cumulus, the base of the cumulus is at a different level from that of the stratocumulus
	9	Cumulonimbus, the upper part of which is clearly fibrous (cirriform), often in the form of an anvil, either accompanied or not by cumulonimbus without an anvil or fibrous part, by cumulus, stratocumulus, stratus or pannus
	/	Stratocumulus, stratus, cumulus or cumulonimbus are invisible owing to fog, darkness or other surface phenomena
# 'Bad weather' denotes the conditions which generally exist during precipitation and a short time before and after		

Figure 21. Symbols used to denote the types of low level cloud present when plotted on a synoptic chart.

Cloud symbols used on a synoptic chart for medium cloud (C_M)

C_M = Altocumulus (Ac), Altostratus (As) and Nimbostratus (Ns)

Symbol	Code figure	Description
	0	No altocumulus, altostratus or nimbostratus
	1	Altostratus, the greater part of which is semi-transparent; through this part the sun or moon may be weakly visible, as seen through ground glass
	2	Altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or nimbostratus
	3	Altocumulus, the greater part of which is semi-transparent; the various elements of the cloud change only slowly and are all at a single level
	4	Patches (often in the form of almonds or fishes) of altocumulus, the greater part of which is semi-transparent; the clouds occur at one or more levels and the elements are continually changing in appearance
	5	Semi-transparent altocumulus in bands, or altocumulus in one or more fairly continuous layers (semi-transparent or opaque), progressively invading the sky; these altocumulus clouds generally thicken as a whole
	6	Altocumulus resulting from the spreading out of cumulus (or cumulonimbus)
	7	Altocumulus in two or more layers, usually opaque in places or an opaque layer and not progressively invading the sky, or altocumulus together with altostratus or nimbostratus
	8	Altocumulus with sproutings in the form of small towers or battlements, or altocumulus having the appearance of cumuliform tufts
	9	Altocumulus of a chaotic sky, generally at several levels
	/	Altocumulus, altostratus or nimbostratus are invisible owing to fog, darkness or other surface phenomena, or because of the presence of a continuous layer of lower cloud

Figure 22. Symbols used to denote the types of medium level cloud present when plotted on a synoptic chart.

Cloud symbols used on a synoptic chart for high cloud (C_H)

C_H = Cirrus (Ci), Cirrocumulus (Cc) and Cirrostratus (Cs)

Symbol	Code figure	Description
	0	No cirrus, cirrocumulus or cirrostratus
	1	Cirrus in the form of filaments, strands or hooks, not progressively invading the sky
	2	Dense cirrus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of cumulonimbus or cirrus with sproutings in the form of small turrets or battlements or cirrus having the appearance of cumuliform tufts
	3	Dense cirrus, often in the form of an anvil being the remains of the upper parts of cumulonimbus
	4	Cirrus in the form of hooks or of filaments, or both, progressively invading the sky; they generally become denser as a whole
	5	Cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole, but the continuous veil does not reach 45° above the horizon
	6	Cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole, but the continuous veil extends more than 45° above the horizon, without the sky being totally covered
	7	Veil of cirrostratus covering the celestial dome
	8	Cirrostratus not progressively invading the sky and not completely covering the celestial dome
	9	Cirrocumulus alone, or cirrocumulus accompanied by cirrus or cirrostratus or both, but cirrocumulus is predominant
	/	Cirrus, cirrocumulus or cirrostratus are invisible owing to fog, darkness or other surface phenomena, or because of the presence or a continuous layer of lower cloud

Figure 23. Symbols used to denote the types of high level cloud present when plotted on a synoptic chart.

Cloud Symbols used on a Synoptic Chart (METAR Code C)

Symbol	Code figure	Description
	0	Cirrus (Ci)
	1	Cirrocumulus (Cc)
	2	Cirrostratus (Cs)
	3	Altocumulus (Ac)
	4	Altostratus (As)
	5	Nimbostratus (Ns)
	6	Stratocumulus (Sc)
	7	Stratus (St)
	8	Cumulus (Cu)
	9	Cumulonimbus (Cb)

Figure 24. Symbols used to denote the types of cloud present, using the METAR code, when plotted on a synoptic chart.

Cloud heights

Cloud heights are measured in feet. For clouds at 5,000 feet or below, the bases are measured in hundreds of feet, but for bases above 5,000 feet, the bases are measure in multiples of 1,000 feet. In the METAR code, cloud heights are measured and reported in hundreds or thousands of feet. For example:

000 is a cloud base at **<100 feet**	**010** is a cloud base at **1,000 feet**
001 is a cloud base at **100 feet**	**100** is a cloud base at **10,000 feet**
005 is a cloud base at **500 feet**	**250** is a cloud base at **25,000 feet**

Using the METAR code, four oktas of cumulus cloud at 3,000 feet is coded as SCT030. Also using the METAR code, specific clouds such as cumulonimbus and very large cumulus are reported. For example 6 oktas of cumulonimbus at 2,500 feet is coded as BKN025CB.

On a synoptic chart, only two figures for the cloud height are plotted. As a result, a code is used to denote the cloud heights. For cloud heights of 5,000 feet and below the first two figures are used to denote cloud height. For cloud heights above 5,000, the 000s are removed and 50 is added to the remaining digit. Cloud heights above 5,000 are usually measured in increments of 1,000 feet.

Actual cloud height (feet)	Plotted cloud height	Actual cloud height (feet)	Plotted cloud height	Actual cloud height (feet)	Plotted cloud height	Actual cloud height (feet)	Plotted cloud height
<100	00	1,600	16	3,200	32	4,800	48
100	01	1,700	17	3,300	33	4,900	49
200	02	1,800	18	3,400	34	5,000	50
300	03	1,900	19	3,500	35	6,000	56
400	04	2,000	20	3,600	36	7,000	57
500	05	2,100	21	3,700	37	8,000	58
600	06	2,200	22	3,800	38	9,000	59
700	07	2,300	23	3,900	39	10,000	60
800	08	2,400	24	4,000	40	11,000	61
900	09	2,500	25	4,100	41	12,000	62
1000	10	2,600	26	4,200	42		
1100	11	2,700	27	4,300	43		
1200	12	2,800	28	4,400	44		
1300	13	2,900	29	4,500	45		
1400	14	3,000	30	4,600	46		
1500	15	3,100	31	4,700	47	25,000	75

Figure 25. Cloud height codes.

Low cloud			
			
4/30	6/25	7/02	4/15
4 oktas of cumulus humilis at 3,000 feet	6 oktas of stratocumulus at 2,500 feet	7 oktas of stratus nebulosus at 200 feet	4 oktas of cumulonimbus capillatus cloud at 1,500 feet
Medium cloud			
			
8/60	6/62	4/60	7/61
8 oktas of altostratus opacus at 10,000 feet	6 oktas of altocumulus (type 5) at 12,000 feet	4 oktas of altocumulus lenticularis at 10,000 feet	7 oktas of altocumulus of a chaotic sky at 11,000 feet
High cloud			
			
4/75	3/70	8/75	6/71
4 oktas of cirrus uncinus (type 1) at 25,000 feet	3 oktas of dense cirrus (type 3) at 20,000 feet	8 oktas of cirrostratus at 25,000 feet	6 oktas of cirrocumulus at 21,000 feet

Figure 26. Examples of cloud symbols and heights plotted on a synoptic chart.

Wind (ddff)

The surface wind direction is indicated on the station circle by an arrow flying with the wind, the point touching the circle. Direction (dd) is measured in degrees from true North. The speed of the wind (ff) is given by the number of 'feathers' on the arrow. The symbols used over the years are as follows:

Wind arrows (ff) used up to 31 December 1913

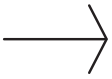
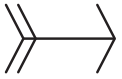
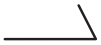
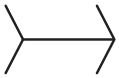
Symbol	Beaufort force	Symbol	Beaufort force	Symbol	Beaufort force
	0–1		5–7		>10
	2–4		8–10		

Figure 27. Wind arrows used before December 1913.

Wind arrows (ff) used between 1 January 1914 and 31 December 1924

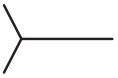
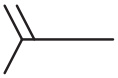
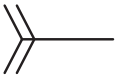
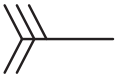
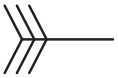
Symbol	Beaufort force	Wind	Speed (mph)	Symbol	Beaufort force	Wind	Speed (mph)
	0	Calm	<1		7	High wind	32–38
	1	Light air	1–3		8	Gale	39–46
	2	Slight breeze	4–7		9	Strong gale	47–54
	3	Gentle breeze	8–12		10	Whole gale	55–63
	4	Moderate breeze	13–18		11	Storm	64–72
	5	Fresh Breeze	19–24		12	Hurricane	>=73
	6	Strong breeze	25–31				

Figure 28. Wind arrows used between January 1914 and December 1924.

Wind arrows (ff) used between 1 January 1925 and 29 March 1936

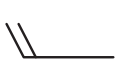
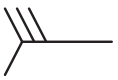
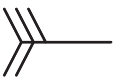
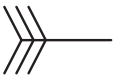
Symbol	Beaufort force	Wind	Speed (mph)	Symbol	Beaufort force	Wind	Speed (mph)
	0	Calm	<1		7	High wind	32–38
	1	Light air	1–3		8	Gale	39–46
	2	Slight breeze	4–7		9	Strong gale	47–54
	3	Gentle breeze	8–12		10	Whole gale	55–63
	4	Moderate breeze	13–18		11	Storm	64–72
	5	Fresh Breeze	19–24		12	Hurricane	>=73
	6	Strong breeze	25–31				

Figure 29. Wind arrows used between January 1925 and December 29 March 1936.

Wind arrows (ff) used between 30 March 1936 and December 1954

Symbol	Beaufort force	Wind	Speed (mph)	Symbol	Beaufort force	Wind	Speed (mph)
	0	Calm	<1		7	High wind	32–38
	1	Light air	1–3		8	Gale	39–46
	2	Slight breeze	4–7		9	Strong gale	47–54
	3	Gentle breeze	8–12		10	Whole gale	55–63
	4	Moderate breeze	13–18		11	Storm	64–72
	5	Fresh Breeze	19–24		12	Hurricane	>=73
	6	Strong breeze	25–31				

Figure 30. Wind arrows used between 30 March 1936 and December 1954.

Wind arrows (ff) used since 1 January 1955

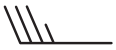
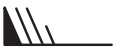
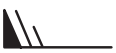
Symbol	Description	Symbol	Description	Symbol	Description
	Calm		33–37 knots		73–77 knots
	1–2 knots		38–42 knots		78–82 knots
	3–7 knots		43–47 knots		83–87 knots
	8–12 knots		48–52 knots		88–92 knots
	13–17 knots		53–57 knots		93–97 knots
	18–22 knots		58–62 knots		98–102 knots
	23–27 knots		63–67 knots		Wind direction variable
	28–32 knots		68–72 knots		Wind direction given, wind speed missing

Figure 31. Wind arrows used since January 1955.

Beaufort letters

A code of letters indicating the state of the weather, past or present. The code was originally introduced by Admiral Beaufort for use at sea but it is equally convenient for use on land. Additions have been made to the original schedule.

A fully comprehensive list of Beaufort letters follows. Note the symbols used for the individual weather elements – not all Beaufort letters have a corresponding weather symbol and likewise, not all weather elements have a Beaufort letter but may have a weather symbol.

State of sky

See cloud amount (pre 1914) section earlier in this fact sheet for Beaufort letters used to describe cloud amount.

Hydrometeors

Beaufort letter	Symbol	Description
r		Rain
r		Freezing rain
d		Drizzle
d		Freezing drizzle
s		Snow
h		Snow pellets
h		Diamond dust
h		Hail
h		Small hail
h		Ice pellets
sh		Snow grains
f		Fog
f		Ice fog
fe		Wet fog
fg/fs		Patches of shallow fog over land/sea
fg/fs		More or less continuous shallow fog over land/sea

Beaufort letter	Symbol	Description
m		Mist
ks		Drifting and blowing snow
ks		Drifting snow
ks		Blowing snow
		Spray
w		Dew
w		Advection dew
w		White dew
x		Hoar frost
x		Advection hoar frost
		Rime
		Soft rime
		Hard rime
		Clear ice
		Glaze
		Sprout

Figure 32. Hydrometeors – a generic term for products of condensation and sublimation of atmospheric water vapour.

Mixed precipitation

Beaufort letter	Symbol	Description
dr		Drizzle and rain
rs		Rain and snow (sleet)
hs		Hail and snow
hr		Hail and rain

Figure 33. Beaufort letters denoting mixed precipitation.

Lithometeors

Beaufort letter	Symbol	Description
z		Haze
		Dust haze
		Smoke
		Drifting and blowing dust or sand
		Drifting dust or sand
		Blowing dust or sand
		Duststorm or sandstorm
		Wall of dust or sand
		Dust whirl or sand whirl (dust devil)

Figure 34. Lithometeors – a little-used generic term for non-aqueous solid particles suspended in the air or lifted from the Earth's surface.

Electrometeors

Beaufort letter	Symbol	Description
tl		Thunderstorm
l		Lightning
		St Elmo's fire
		Polar aurora

Figure 35. Electrometeors – a little-used generic term for the visible or audible manifestation of atmospheric electricity.

Photometeors

Beaufort letter	Symbol	Description
		Solar halo
		Lunar halo
		Solar corona
		Lunar corona
		Irisation
		Glory
		Rainbow
		Fog-bow
		Bishop's ring
		Mirage
		Zodiacal light

Figure 36. Photometeors – a little-used generic term for optical phenomena in the atmosphere.

Miscellaneous

Beaufort letter	Symbol	Description
j		Phenomena within sight of but not at the station
e		Wet air, without rain falling
y		Dry air (less than 60% relative humidity)
u		Ugly threatening sky
v		Abnormally good visibility
p		Shower (used in conjunction with a type of precipitation)

Figure 37. Beaufort letters used for miscellaneous meteorological phenomena.

Surface wind

Beaufort letter	Symbol	Description
g		Gale: mean speed 34–47 knots over a period of ten minutes or more
G		Storm: mean speed 48 knots or more over a period of ten minutes or more
Q		Squall
kq		Line squall

Figure 38. Beaufort letters used to describe the strength of the surface wind.

Recording Beaufort letters

When recording Beaufort letters, it is helpful to give an indication of the intensity and continuity of the weather elements being observed. More than one Beaufort letter can be used if, for example, the precipitation is in the form of showers.

The type of precipitation is indicated by the appropriate Beaufort letter or combination of letters if there is a mixture of precipitation. For example:

Beaufort letter	Description
d	Drizzle
r	Rain
dr	Drizzle and rain

Figure 39. Beaufort letters used to describe the type of precipitation present.

If the precipitation is of the showery type (falling from convective cloud), the prefix 'p' is used in combination with the type of precipitation. For example:

Beaufort letter	Description
pr	Shower of rain
ps	Shower of snow

Figure 40. Beaufort letters used to describe the nature of precipitation present.

Beaufort letters can also be used to describe the intensity of the precipitation.

- **Slight** – by the addition of the subscript 'o' to a small Beaufort letter. For example:

Beaufort letter	Description
r_o	Slight rain
s_o	Slight snow
pr_o	Slight shower of rain

Figure 41. Beaufort letters used to describe precipitation of slight intensity.

- **Moderate** – by a small Beaufort letter. For example:

Beaufort letter	Description
r	Moderate rain
s	Moderate snow
pr	Shower of rain

Figure 42. Beaufort letters used to describe precipitation of moderate intensity.

- **Heavy** – by a capital Beaufort letter. For example:

Beaufort letter	Description
R	Heavy rain
S	Heavy snow
pR	Heavy shower of rain

Figure 43. Beaufort letters used to describe precipitation of heavy intensity.

- **Violent** – by the addition of the subscript '2' to the capital Beaufort letter. For example:

Beaufort letter	Description
pR_2	Violent shower of rain

Figure 44. Beaufort letters used to describe precipitation of violent intensity.

When mixed precipitation occurs, such as drizzle and rain, or rain and snow, the intensity of each type is not given separately, but the intensity of the heaviest precipitation is used to denote the intensity of all the other types in the mixture. For example:

Beaufort letter	Description
dr	Slight drizzle and moderate rain

Figure 45. Beaufort letters used to describe mixed precipitation of mixed intensities.

The intensity of a thunderstorm is judged by the intensity of the thunder and lightning, whilst the intensity of the precipitation in the storm is indicated separately. For example:

Beaufort letter	Description
TLr$_o$	Heavy thunderstorm with slight rain
tl$_o$R	Slight thunderstorm with heavy rain

Figure 46. Beaufort letters used to describe the intensity of thunderstorms and the intensity of the precipitation falling during the thunderstorm.

When showers are reported, the qualification of intensity is given to the precipitation, but not to the shower prefix ‘p’. For example:

Beaufort letter	Description
pr$_o$	Slight shower of rain
pr	Shower of rain
pR	Heavy shower of rain

Figure 47. Beaufort letters used to describe the intensity of showers.

The continuity of the precipitation can also be indicated using Beaufort letters. Precipitation falling from layer cloud is described by letters referring to the continuity as well as to the type and intensity in accordance with the following rules:

1. **Intermittent precipitation** – the Beaufort letters indicating the type and intensity of the precipitation are prefixed by the letter 'i'. For example:

Beaufort letter	Description
ir_o	Intermittent slight rain
iS	Intermittent heavy snow
idr	Intermittent moderate drizzle and rain
The prefix indicates that there has been a break or breaks occurring at intervals of less than one hour in the overall period of the precipitation. Note that an individual break lasting one hour or more requires subsequent precipitation to be recorded as the commencement of another period.	

Figure 48. Beaufort letters to describe the intermittent nature of the precipitation.

2. **Continuous precipitation** – the Beaufort letter(s) indicating the type and intensity of the precipitation are repeated. For example:

Beaufort letter	Description
r_or_o	Continuous slight rain
SS	Continuous heavy snow
$d_or_od_or_o$	Continuous slight drizzle and rain
The repetition indicates that the period of precipitation has lasted for at least one hour without a break.	

Figure 49. Beaufort letters to describe the continuous nature of the precipitation.

3. Precipitation not specified as intermittent or continuous: the Beaufort letter(s) indicating the type and intensity of the precipitation are used alone. For example:

Beaufort letter	Description
R	Heavy rain
d_o	Slight drizzle
dr	Moderate drizzle and rain
This indicates that the period of precipitation has not lasted for one hour to qualify as continuous, and that there have been no breaks to qualify it as intermittent.	

Figure 50. Beaufort letters to describe the intensity of the precipitation.

4. Changes of type and/or intensity. During a period of precipitation a change of type and/or intensity is indicated by successive use of letters descriptive of each new type or intensity. Repetition of letters to indicate continuity will be appropriate only when precipitation of one particular type and intensity has continued for at least one hour without a break. A change in type or intensity of continuous precipitation where the new type or intensity does not last for one hour will require the use of a single letter as described above. At each change of type and/or intensity it is necessary to record all the appropriate letters in the order specified and a comma is placed between each group of letters. For example:

Beaufort letter	Description
$cr_or_o\,cr$ $cr_o\,cd_or_od_or_o$	Total cloud amount 6/8-8/8 with continuous slight rain, then total cloud amount 6/8-8/8 with moderate rain, then total cloud amount 6/8-8/8 with slight rain, then total cloud amount 6/8-8/8 with continuous slight drizzle and rain

Figure 51. Beaufort letters to describe the changes in intensity of the precipitation during the reporting period.

When reporting any type of atmospheric obscurity, for example, fog or mist, it is possible to give an indication as to the thickness of this type of phenomenon.

- **Fog** – whenever the visibility is reduced to less than 1,000 metres and the obscuration is caused by fog, the letter 'f' (fog) will be used down to and including 200 metres, and the capital letter 'F' (thick fog) when the visibility is less than 200 metres. When patches of fog exist, the prefix 'i' is used to denote intermittent fog. For example:

Beaufort letter	Description
if	Fog patches with visibility below 1,000 metres but at or above 200 metres
F	Thick fog with visibility below 200 metres
iF	Thick fog patches with visibility below 200 metres

Figure 52. Beaufort letters to describe the thickness and/or continuous nature of fog.

- Mist – this is when the visibility is 1,000 metres or more and the relative humidity is between 95 and 100 %. The Beaufort letter used is 'm'. The capital letter 'M' is never used.
- Haze – this is when the visibility is 1,000 metres or more but the relative humidity is less than 95%. The Beaufort letter used is 'z'.

When a given weather phenomenon is within sight but not actually falling at the station it is possible to indicate this using Beaufort letters. The letter 'j' is used in combination with various other Beaufort letters to record phenomena occurring within sight of but not at the station. For example:

Beaufort letter	Description
jp	Precipitation within sight
jf	Fog within sight
jks	Drifting snow within sight
No qualification of intensity or indication of the type of precipitation is applied to adjacent precipitation, 'jp', even though this might be surmised. Adjacent precipitation is not used to describe a shower which was previously reported at the station and is still visible on the horizon.	

Figure 53. Beaufort letters to describe the locality of the precipitation in relation to the position of the observer.

Present weather symbols used on a synoptic chart from manned stations

Code figure	Symbol	Description	
ww=00 to 19: No precipitation, fog (except for 11 and 12), duststorm, sandstorm, drifting or blowing snow at the station at the time of observation or, except for 09 and 17, during the preceding hour			
00		Cloud development not observed or observable	Characteristic state of sky during the past hour
01		Cloud(s) dissolving or becoming less developed	
02		State of sky on the whole unchanged	
03		Cloud(s) generally forming or developing	
04		Visibility reduced by smoke haze	
05		Haze	
06		Widespread dust in suspension in the air, not raised by wind at or near station at the time of observation	
07		Dust or sand raised by the wind at or near the station at the time of observation, but not well developed dust whirl(s), and no sandstorm seen; or, in the case of ships, blowing spray at the station	
08		Well developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm	
09		Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour	
10		Mist	
11		Patches of shallow fog or ice fog	
12		More or less continuous shallow fog or ice fog less than 2 metres on land or 10 metres at sea	
13		Lightning seen, no thunder heard	
14		Precipitation within sight, not reaching the ground or the surface of the sea	
15		Precipitation within sight, reaching the ground or the surface of the sea, but distant (estimated to be more than 5 km from the station)	
16		Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station	
17		Thunderstorm, but no precipitation at the time of observation	
18		Squall(s) at or within sight of the station during the preceding hour or at the time of observation	
19		Funnel cloud(s) at or within sight of the station during the preceding hour or at the time of observation	

Figure 54. Present weather code and weather symbols.

Present weather symbols used on a synoptic chart from manned stations

Code figure	Symbol	Description
ww=20 to 29: Precipitation, fog, ice fog or thunderstorm at the station during the preceding hour but not at the time of observation		
20		Drizzle (not freezing) or snow grains, not falling as showers
21		Rain (not freezing), not falling as showers
22		Snow, not falling as showers
23		Rain and snow or ice pellets, not falling as showers
24		Freezing drizzle or freezing rain, not falling as showers
25		Shower(s) of rain
26		Shower(s) of snow, or of rain and snow
27		Shower(s) of hail, or of rain and hail
28		Fog or ice fog
29		Thunderstorm (with or without precipitation)
ww=30 to 39: Duststorm, sandstorm, drifting or blowing snow		
30		Slight or moderate duststorm or sandstorm – has decreased during the preceding hour
31		Slight or moderate duststorm or sandstorm – no appreciable change during the preceding hour
32		Slight or moderate duststorm or sandstorm – has begun or increased during the preceding hour
33		Severe duststorm or sandstorm – has decreased during the preceding hour
34		Severe duststorm or sandstorm – no appreciable change during the preceding hour
35		Severe duststorm or sandstorm – has begun or increased during the preceding hour
36		Slight or moderate drifting snow, generally low (below eye level)
37		Heavy drifting snow, generally low (below eye level)
38		Slight or moderate drifting snow, generally high (above eye level)
39		Heavy drifting snow, generally high (above eye level)

Figure 54. Present weather code and weather symbols.

Present weather symbols used on a synoptic chart from manned stations

Code figure	Symbol	Description
ww=40 to 49: Fog or ice fog at the time of observation		
40		Fog or ice at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer
41		Fog or ice fog in patches
42		Fog or ice fog, sky visible, has become thinner during the preceding hour
43		Fog or ice fog, sky obscured, has become thinner during the preceding hour
44		Fog or ice fog, sky visible, no appreciable change during the preceding hour
45		Fog or ice fog, sky obscured, no appreciable change during the preceding hour
46		Fog or ice fog, sky visible, has begun or become thicker during the preceding hour
47		Fog or ice fog, sky obscured, has begun or become thicker during the preceding hour
48		Fog, depositing rime, sky visible
49		Fog, depositing rime, sky obscured
ww=50 to 59: Drizzle		
50		Drizzle, not freezing, intermittent – slight at the time of observation
51		Drizzle, not freezing, continuous – slight at the time of observation
52		Drizzle, not freezing, intermittent – moderate at the time of observation
53		Drizzle, not freezing, continuous – moderate at the time of observation
54		Drizzle, not freezing, intermittent – heavy (dense) at the time of observation
55		Drizzle, not freezing, continuous – heavy (dense) at the time of observation
56		Drizzle, freezing, slight
57		Drizzle, freezing, moderate or heavy (dense)
58		Drizzle and rain, slight
59		Drizzle and rain, moderate or heavy (dense)

Figure 54. Present weather code and weather symbols.

Present weather symbols used on a synoptic chart from manned stations

Code figure	Symbol	Description
ww=60 to 69: Rain		
60		Rain, not freezing, intermittent – slight at the time of observation
61		Rain, not freezing, continuous – slight at the time of observation
62		Rain, not freezing, intermittent – moderate at the time of observation
63		Rain, not freezing, continuous – moderate at the time of observation
64		Rain, not freezing, intermittent – heavy at the time of observation
65		Rain, not freezing, continuous – heavy at the time of observation
66		Rain, freezing, slight
67		Rain, freezing, moderate or heavy
68		Rain, or drizzle and snow, slight
69		Rain, or drizzle and snow, moderate or heavy
ww=70 to 79: Solid precipitation not in showers		
70		Intermittent fall of snowflakes – slight at the time of observation
71		Continuous fall of snowflakes – slight at the time of observation
72		Intermittent fall of snowflakes – moderate at the time of observation
73		Continuous fall of snowflakes – moderate at the time of observation
74		Intermittent fall of snowflakes – heavy at the time of observation
75		Continuous fall of snowflakes – heavy at the time of observation
76		Diamond dust (with or without fog)
77		Snow grains (with or without fog)
78		Isolated star-like snow crystals (with or without fog)
79		Ice pellets

Figure 54. Present weather code and weather symbols.

Present weather symbols used on a synoptic chart from manned stations

Code figure	Symbol	Description
ww=80 to 89: Showery precipitation, or precipitation with current or recent thunderstorms		
80		Rain shower(s), slight
81		Rain shower(s), moderate or heavy
82		Rain shower(s), violent
83		Shower(s) or rain and snow mixed, slight
84		Shower(s) or rain and snow mixed, moderate or heavy
85		Snow shower(s), slight
86		Snow shower(s), moderate or heavy
87		Shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed, slight
88		Shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed, moderate or heavy
89		Shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder, slight
ww=90 to 94: Thunderstorm during the preceding hour but not at the time of observation		
90		Shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder, moderate or heavy
91		Slight rain at the time of observation
92		Moderate or heavy rain at the time of observation
93		Slight snow, or rain and snow, or hail at the time of observation
94		Moderate or heavy snow, or rain and snow mixed, or hail at the time of observation
ww=95 to 99: Thunderstorm at the time of observation		
95		Thunderstorm, slight or moderate, without hail but with rain and/or snow at the time of observation
96		Thunderstorm, slight or moderate, with hail at the time of observation
97		Thunderstorm, heavy, without hail but with rain and/or snow at the time of observation
98		Thunderstorm, combined with duststorm or sandstorm at the time of observation
99		Thunderstorm, heavy, with hail at the time of observation

Figure 54. Present weather code and weather symbols.

Weather elements used in the METAR code

Intensity	Description	Precipitation	Obscuration	Others
– Light	***MI*** Shallow	***DZ*** Drizzle	***BR*** Mist	***PO*** Well developed dust/sand whirls
Moderate	***PR*** Partial	***RA*** Rain	***FG*** Fog	***SQ*** Squalls
+ Heavy	***BC*** Patches	***SN*** Snow	***FU*** Smoke	***FC*** Funnel clouds including tornadoes and waterspouts
VC Vicinity	***DR*** Low drifting	***SG*** Snow grains	***VA*** Volcanic ash	***SS*** Sand storm
	BL Blowing	***IC*** Ice crystals	***DU*** Widespread dust	***DS*** Dust storm
	SH Showers	***PL*** Ice pellets	***SA*** Sand	***CB*** Cumulonimbus
	TS Thunderstorms	***GR*** Hail	***HZ*** Haze	***TCU*** Towering cumulus
	FZ Freezing	***GS*** Small hail	***PY*** Spray	
		UP Unknown		

Figure 55. Present weather code and symbols used when plotting METAR observations.

Some examples of present weather codes used in a METAR

TSRA – Moderate thunderstorm with rain

RASH – Moderate rain shower(s)

VCFG – Fog in the vicinity

RASN – Moderate rain and snow (sleet)

MIFG – Shallow fog

+RA – Heavy rain

+SNSH – Heavy snow shower(s)

–RASH – Slight rain shower(s)

METAR observations only report the weather at the time of observation. No past weather elements are reported as would be the case with the synoptic code.

Present weather symbols used on early synoptic charts and Daily Weather Reports

Symbol	Description
●	Rain
✳	Snow
✱	Rain and snow (sleet)
▲	Hail
≡	Fog
≡°	Mist
⊤	Thunder
⊼	Thunderstorm
∿∿	Sea disturbance-rough
≈≈	Sea disturbance-high

Figure 56. Present weather symbols used on early synoptic charts.

Past weather symbols used on synoptic charts

Code figure	Symbol	Description
0		Cloud cover $^1/_2$ or less of the sky throughout the appropriate period
1		Cloud cover $^1/_2$ or less for part of the appropriate period and more than $^1/_2$ for part of the period.
2		Cloud cover more than $^1/_2$ of the sky throughout the appropriate period
3		Duststorm, sandstorm or blowing snow — visibility less than 1,000 metres
4		Fog or thick haze
5		Drizzle
6		Rain
7		Snow
8		Showers
9		Thunderstorm, with or without precipitation

Figure 57. Past weather symbols used on synoptic charts.

Pressure tendency

Symbol	Description of curve	Pressure now compared with three hours ago
	Rising, then falling	Higher
	Rising, then steady	Higher
	Rising	Higher
	Falling, then rising	Higher
	Falling, then rising	Lower
	Falling, then steady	Lower
	Falling	Lower
	Rising, then falling	Lower

Figure 58. Pressure tendency.

Visibility

Surface visibilities as used in the Daily Weather Reports.

Code for surface visibility	Objects not visible at:	Description
0	55 yards	Dense fog
1	220 yards	Thick fog
2	550 yards	Fog
3	1100 yards	Moderate fog
4	1.25 miles	Mist or haze
5	2.5 miles	Poor visibility
6	6.25 miles	Moderate visibility
7	12.5 miles	Good visibility
8	31 miles	Very good visibility
9	>31 miles	Excellent visibility

Figure 59. Description of visibility used in Daily Weather Reports.

Visibility values as used on synoptic charts

1. The 90-99 decade is always employed in ship reports for the reason that horizontal visibility cannot be determined with greater accuracy at sea.
2. If the horizontal visibility is not the same in different directions, the shorter distance is coded.
3. If the observed horizontal visibility is between two of the distances given in the table, the code figure for the shorter distance is reported.
4. In the international scale the distances for all code figures are expressed in metres. The visibilities listed below are the equivalent distances in nautical miles.

Visibility values as used on synoptic charts

- For visibilities equal to or less than 5 km

Land stations only								
Code figure	Distance		Code figure	Distance		Code figure	Distance	
	km	yards		km	yards		km	yards
00	<0.0	<110	19	1.9	2,075	38	3.8	4,157
01	0.1	110	20	2.0	2,118	39	3.9	4,266
02	0.2	220	21	2.1	2,297	40	4.0	4,376
03	0.3	330	22	2.2	2,406	41	4.1	4,485
04	0.4	440	23	2.3	2,516	42	4.2	4,594
05	0.5	550	24	2.4	2,625	43	4.3	4,737
06	0.6	660	25	2.5	2,735	44	4.4	4,813
07	0.7	770	26	2.6	2,844	45	4.5	4,923
08	0.8	880	27	2.7	2,953	46	4.6	5,032
09	0.9	990	28	2.8	3,063	47	4.7	5,141
10	1.0	1,100	29	2.9	3,172	48	4.8	5,251
11	1.1	1,210	30	3.0	3,282	49	4.9	5,360
12	1.2	1,313	31	3.1	3,391	50	5.0	5,470
13	1.3	1,422	32	3.2	3,500	51	Not used	
14	1.4	1,532	33	3.3	3,610	52		
15	1.5	1,641	34	3.4	3,719	53		
16	1.6	1,750	35	3.5	3,829	54		
17	1.7	1,859	36	3.6	3,938	55		
18	1.8	1,969	37	3.7	4,047			

- For visibilities greater than 5 km

Land stations only						Ship observations		
Code figure	Distance		Code figure	Distance		Code figure	Distance	
	km	miles		km	miles		km	miles
56	6	3.2	73	23	12.4	90	<0.05	<0.03
57	7	3.8	74	24	13.0	91	0.05	0.03
58	8	4.3	75	25	13.5	92	0.2	0.1
59	9	4.9	76	26	14.0	93	0.5	0.3
60	10	5.4	77	27	14.6	94	1.0	0.5
61	11	5.9	78	28	15.1	95	2.0	1.1
62	12	6.5	79	29	15.7	96	4.0	2.2
63	13	7.0	80	30	16.2	97	10.0	5.4
64	14	7.6	81	35	18.9	98	20.0	11.0
65	15	8.1	82	40	21.6	99	≥50	≥27
66	16	8.6	83	45	24.3			
67	17	9.2	84	50	27.0			
68	18	9.7	85	55	29.7			
69	19	10.3	86	60	32.4		Not used	
70	20	10.8	87	65	35.1			
71	21	11.3	88	70	37.8			
72	22	11.9	89	>70	>37.8			

Figure 60. Visibility codes used for land and ship reports.

- Visibility reporting using the METAR code.

Visibility is recorded as a four figure group (in metres). For example:

Code	As plotted	Description
0000	F00	Less than 50 metres
0200	F02	200 metres
1000	10	1,000 metres
2500	25	2,500 metres
5000	50	5,000 metres
9000	59	9,000 metres
9999	>59	Greater than or equal to 10,000 metres

Figure 61. Visibility codes used for METAR observations.

It is also possible with the METAR code to highlight visibilities in various directions. For example, if you had a visibility to the southwest of the airfield of 1,000 metres yet to the north of the airfield it was 9,000 metres you could indicate this in the visibility code, thus:

1000SW 9000N

When the visibility is particularly poor across a runway at an airfield, you can express this in the **Runway Visual Range** code.

Runway Visual Range is an indication of the real visibility as measured down the runway either electronically or manually. RVR is taken when the Met visibility drops below 1,500 metres and it will therefore only be shown occasionally in METAR reports. RVR visibility will always be prefixed by the letter R followed by the runway for which the value has been taken. For example:

R24/1200 - RVR for runway 24 is 1,200 metres

If the RVR value is below that published for the approach procedure then the aircraft CANNOT MAKE AN APPROACH. The aircraft must either remain in the holding pattern until the weather improves or it must divert.

Air temperature and dew-point

On synoptic charts and weather summaries, temperatures plotted before 1 January 1961 were plotted in Fahrenheit. The Celsius scale of temperature was adopted by the World Meteorological Organization as the standard unit of temperature measurement and was formally adopted by the Met Office on 1 January 1961. Since then all records of temperature by the Met Office have been recorded in Celsius.

A minus value is plotted on a weather chart with a '-' sign in front of it or if it is a METAR an 'M is placed in front. For example:

25/**–12** = Temperature: 25 °C, Dew Point: minus 12 °C, or **00**/**M02**= Temperature: 0 °C, Dew Point: -2 °C.

Decode of weather fronts, centres and isobars found on a synoptic chart

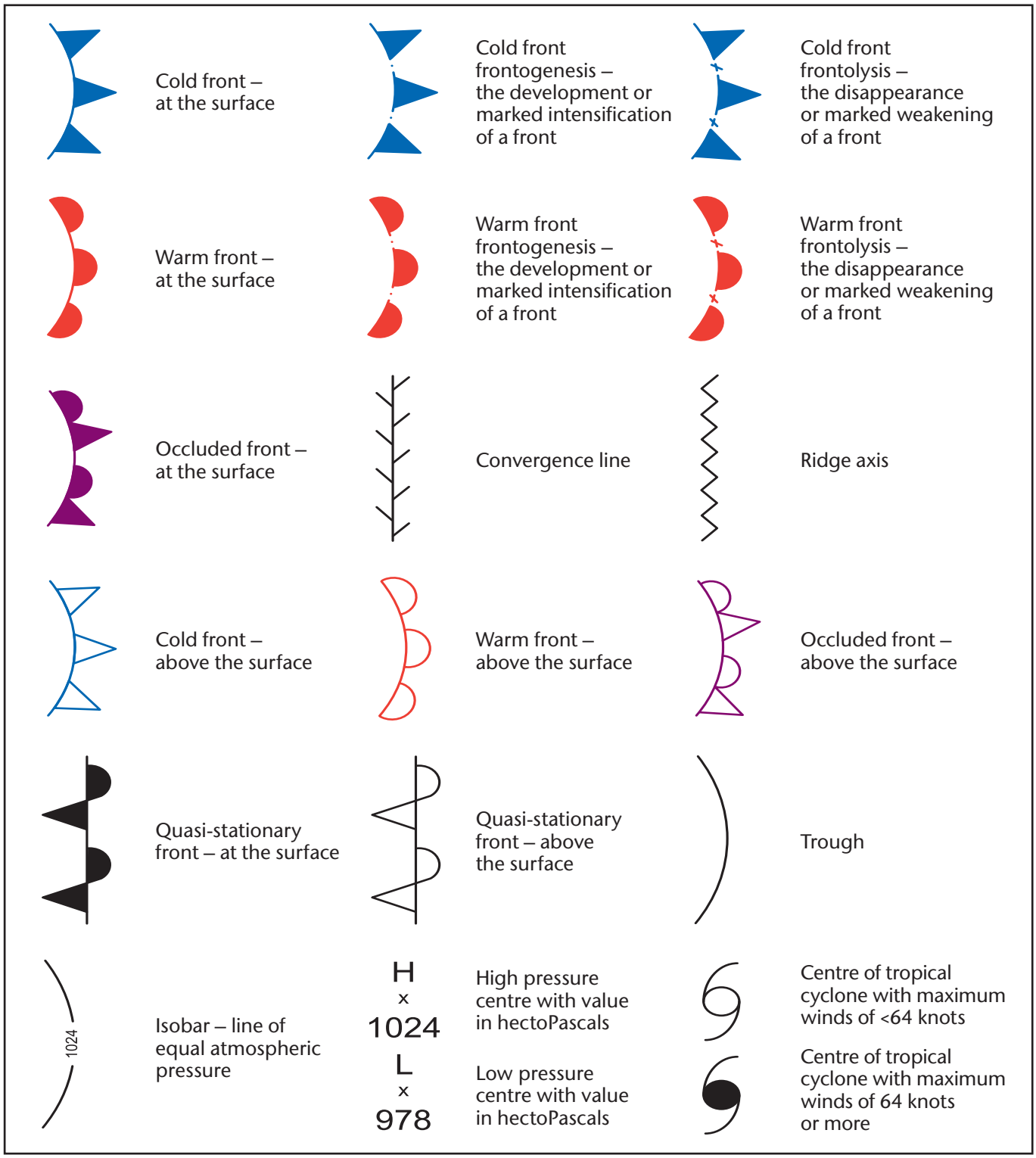


Figure 62. Weather fronts, pressure centres and isobars plotted on a synoptic chart.

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