# 14. Introduction to General Synoptic Features

The general synoptic features which can be identified on weather charts include:

- An anticyclone or high
- A ridge of high pressure
- A col
- A frontal depression or low
- A non-frontal depression or low
- A trough of low pressure

Deep depressions in tropical latitudes are termed *Tropical Revolving Storms* and are called by their regional names; being either termed a hurricane, cyclone or typhoon.

## 14.1 Anticyclones

An anticyclone or *high* is characterised by its centre of high pressure around which are roughly concentric isobars and by its clockwise circulation of winds (in the northern hemisphere). Anticyclones are three-dimensional features and their structures vary with height.

Apart from their pressure and wind patterns, highs and lows show other important differences.

In general highs:

- cover much larger areas than low pressure systems
- are slower moving and are more persistent than lows
- have less steep pressure gradients, especially near their centres
- have winds that are characteristically light and variable near the centre

A new high can form as either an extension of an existing high or as a centre near the original, eventually replacing it.

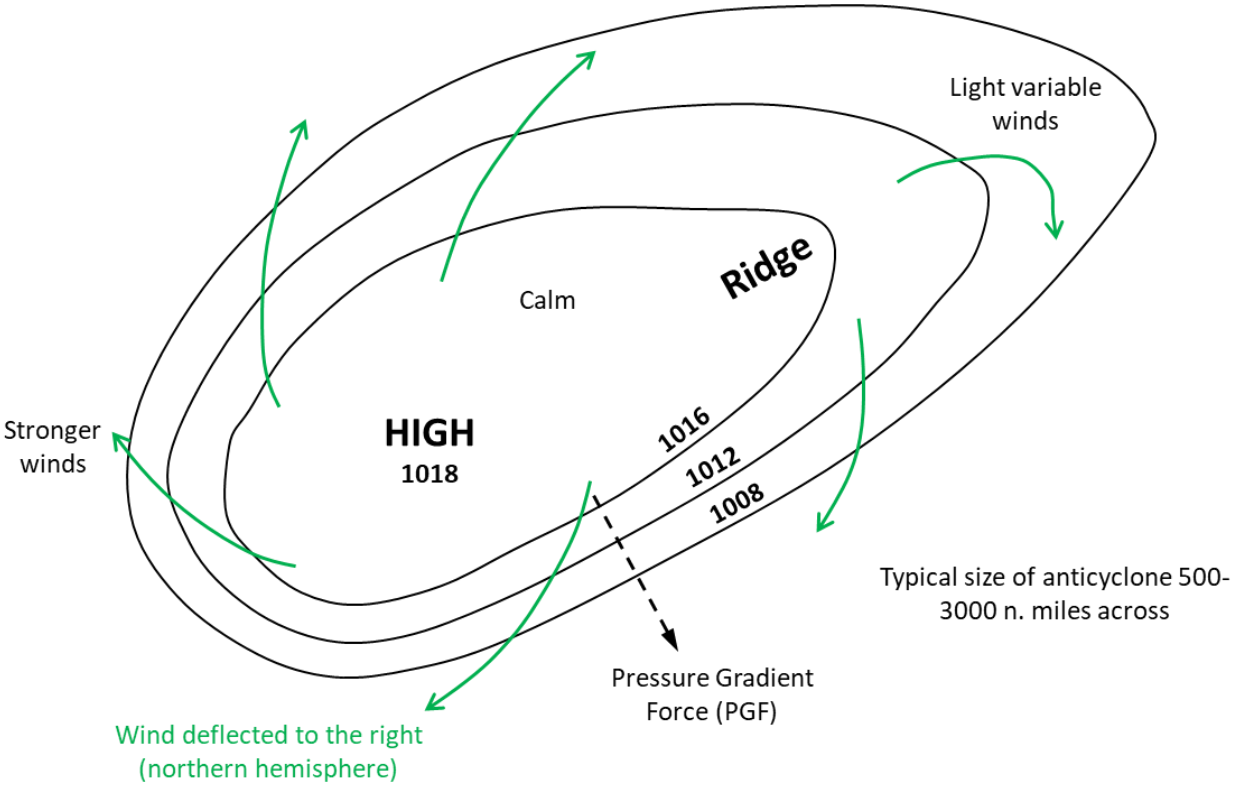


*Fig. 14.1- High pressure or anticyclone.*

## 14.1.1 Typical anticyclone weather

***Summer:***

- Fine, quiet weather, sunshine and high temperatures
- At night, clear skies and ground mist, or fog tends to form over the land
- In coastal waters there may be frequent persistent fog

***Winter:***

(a)

- By day fine, clear and very cold
- By night, frost and fog over the land

Or:

(b)

- Sky is persistently covered by low cloud sheet of Stratocumulus (Sc)

*This is the 'Anticyclonic Gloom' typical of November and December where the clouds are Sc due to the inversion brought about by the subsiding air heating adiabatically.*

## 14.2 Ridge of high pressure

A *ridge of high pressure* is an elongated extension of a high pressure (anticyclone) system.

It is a system of isobars in which pressure is higher on the inside than the outside and therefore has anticyclonic properties. Ridges are often located in the outer regions of anticyclones.

Fast moving ridges occur between individual members of a *depression family*, moving along the Polar Front. They bring intervals of fair weather between the periods of rain or showers associated with the fronts of a depression.

Weather conditions in a ridge resemble those in anticyclones. The ridge brings fine weather on the east side, but for a short period only. Such features are frequently the pre-cursor of a depression so weather generally deteriorates on the western side.

See figure 14.1.

## 14.3 Col

A *col* is an area of intermediate pressure and slack isobars between two highs and two lows *diagonally disposed*.

The weather in a col is essentially any which is compatible with calms, airs or a light breeze. This can include fog, mist, haze, dew, hoar frost, and with a northerly origin Polar Maritime (Pm) air mass, showery cumulus cloud extending to cumulonimbus with thunderstorms and hail.

Winds are light and variable and a col provides the meeting place for two sets of air masses from different directions having different temperatures and humidity characteristics.

Typical weather includes:

***Winter:*** Mixing fogs and mists.

***Summer:*** Clouds and thunderstorms.

## 14.4 Frontal depressions

A depression is a system of *closed isobars* with lower pressure on the inside.

There are many types of depressions but the most important depressions are those which develop on the Polar Front in temperate latitudes. The Polar Front is the boundary between warm tropical air (prevailing westerlies) and cold polar air (Polar Easterlies).


The Polar Front is shaped by the warm and cold fronts of successive depressions and the intervening encroachment of high pressure.

The Polar front will generally migrate south with the formation of a family of depressions until the two air masses become so similar that the front will no longer exist. An intervening high pressure takes over to bring the warm tropical air northwards again on the western side of the high-pressure system to meet the cold Polar Easterlies in the north and the polar front will become re-established and the process starts over again.

See *family of depressions* in Lesson 16.

Figure 14.2 shows a typical low-pressure depression system in the northern hemisphere.

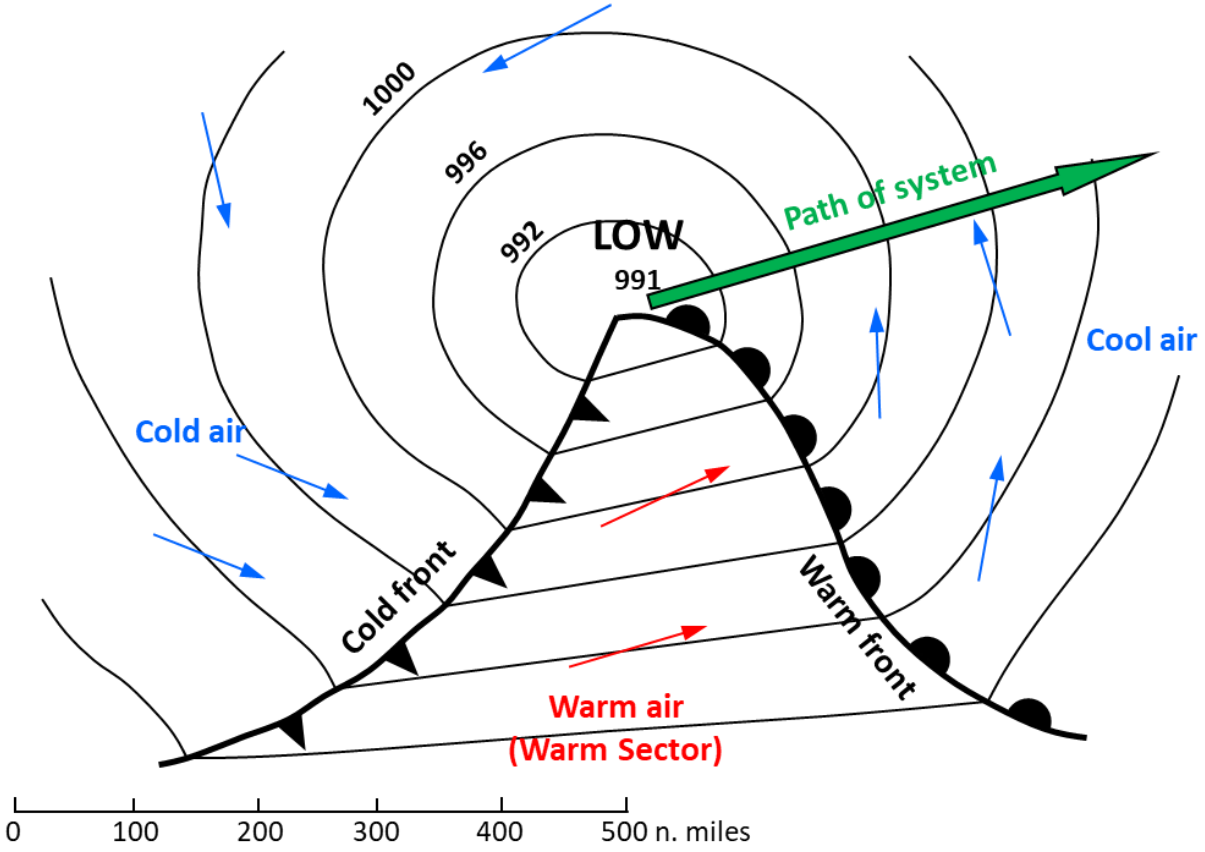


*Fig. 14.2 - Warm sector depression (northern hemisphere).*

Figure 14.3 shows a typical low-pressure depression system in the southern hemisphere.

Note that it is a mirror image; the general path of the centre of the system will be SE instead of NE and the wind circulation is reversed becoming clockwise.

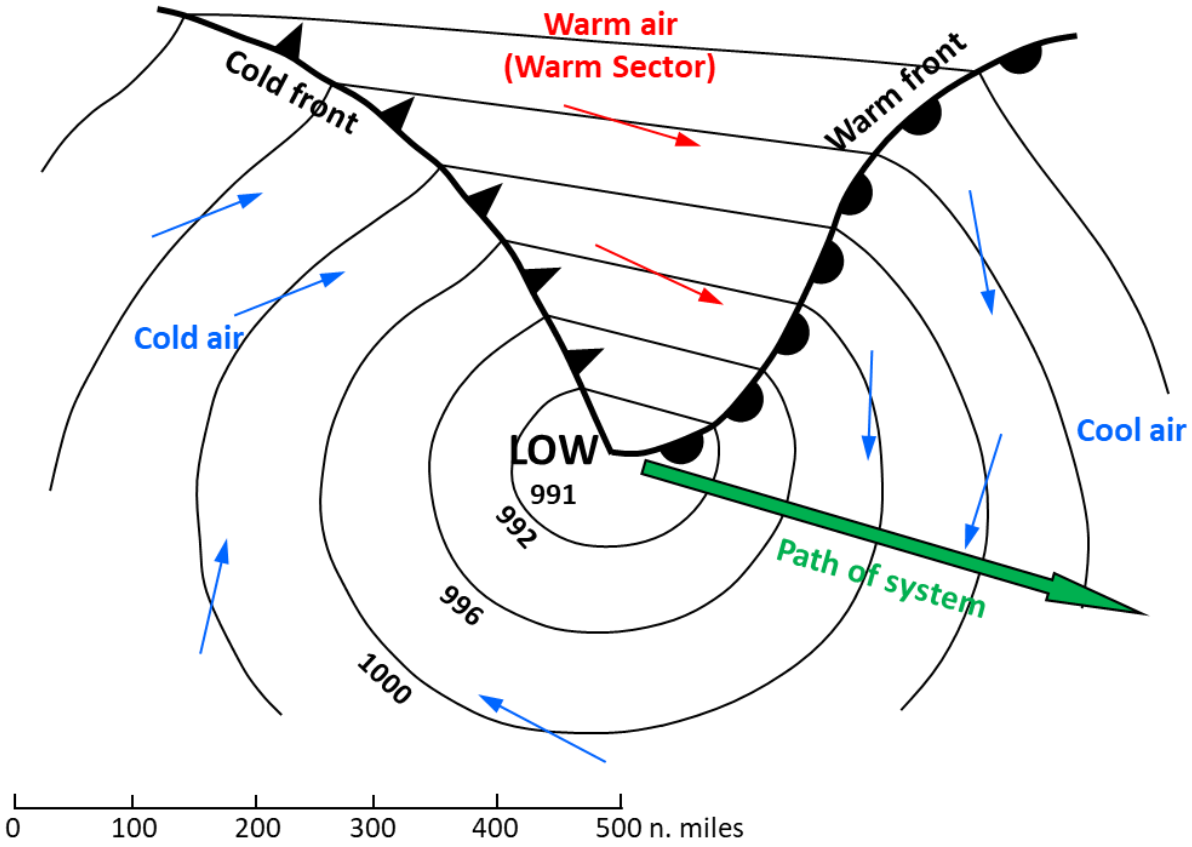


*Fig. 14.3 - Warm sector depression (southern hemisphere).*

**THE FORMATION, LIFE CYCLE AND FEATURES OF A DEPRESSION ARE DISCUSSED IN DETAIL IN LESSON 15.**

## 14.5 Trough of low pressure

A trough is an elongated extension or bulge in the isobaric pattern surrounding a low pressure.

Troughs may be *frontal* or *non-frontal*.

### 14.5.1 Frontal troughs

Frontal troughs may be associated with any type of front: warm, cold or occluded.

An occluded front is described in the Lesson 16; it is a front where the warm sector of a depression has been lifted off the surface progressively as a depression continues to move eastwards and starts to decay.

When associated with a front it is normal for the isobars to have a sudden change in direction at the front. It follows that wind shifts will be abrupt and the barograph trace angled as the frontal trough passes.

The weather associated with the trough is that of the associated front. Isobars resemble 'V' contours of a steep valley, sometimes called a 'V' shaped depression. It is an extension of a low into a high-pressure area. There is a marked change in wind direction with the passage of a trough line.

In the northern hemisphere the wind *veers* and in the southern hemisphere the wind *backs*.


*Veering* is a term used to describe a clockwise change in wind direction e.g. the wind is expected to veer from the North to the Northeast.

*Backing* is a term used to describe an anticlockwise change in wind direction e.g. the wind is expected to back from the South to the Southeast.

Frontal troughs move similarly to a front.

Both patterns of isobars 'point' towards the Equator.

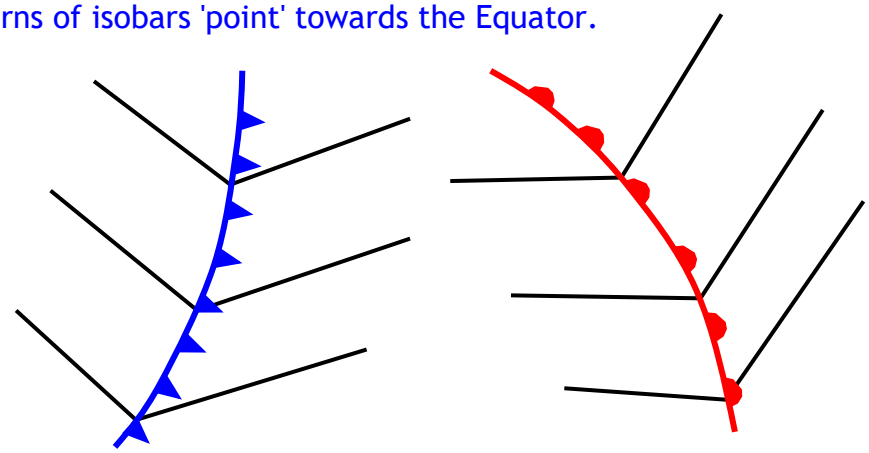

***Fig. 14.4 - Frontal troughs (northern hemisphere).***

## 14.5.2 Non-frontal troughs

Non-frontal troughs are rounded elongations of low pressure extending from low pressure areas which are *not* associated with fronts.

Isobars resemble 'U' shaped contours, being well rounded. Non-frontal toughs occur typically in the cold air mass behind an occluded depression and the resulting increase of pressure gradient often leads to a renewal of strong winds or gales after the depression centre has passed.

A trough may be described as being deep or shallow depending upon the curvature of the isobars. The line joining the points in the trough where the lowest pressures are recorded at each point on the ground during the passage of the trough is known

as the *trough line*.

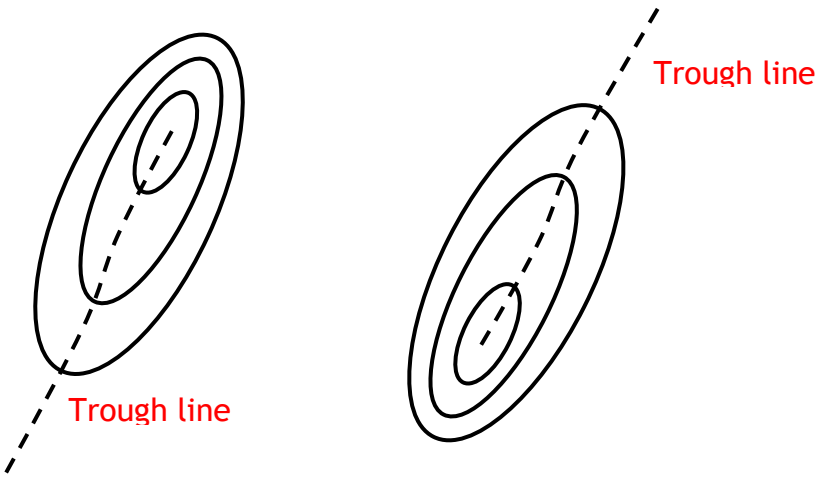


*Fig. 14.5 - Isobar pattern for non-frontal troughs.*

Note that any wind shift can be either a *veer* or a *back* depending both upon the direction of the extrusion and the general movement of the system will be gradual.

The weather associated with the non-frontal will be that of a low-pressure area (tendency for the general ascent of air) giving cloud at all levels and long life to any convection or orographic cloud which forms.

The most extensive cloud and precipitation is usually found ahead of the trough line.

The extent of the bad weather depends upon the curvature of the isobars. Over the British Isles the most extensive cloud and precipitation usually being found ahead of the trough line.

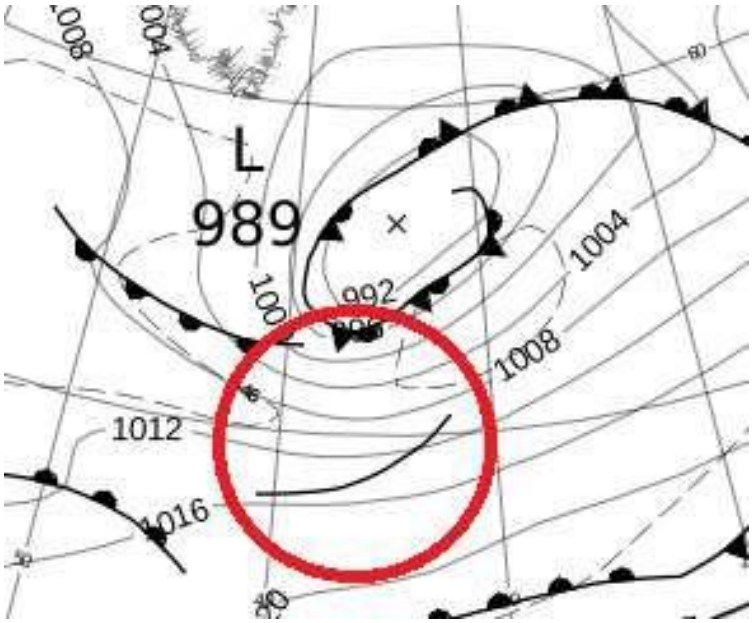


*Fig. 14.6 - Non-frontal trough on a synoptic chart.*

## 14.6 Synoptic charts

The Met Office and other organisations produce synoptic charts for specified times during the day known as the *synoptic hours*.

These are 0000hrs, 0600hrs, 1200hrs and 1800hrs.

A synoptic chart is any map that summarises the atmospheric conditions (temperature, precipitation, wind speed and direction, atmospheric pressure and cloud coverage over a wide area at a given time. They display an overview of the weather conditions observed from many different weather stations, aircraft, balloons and satellites.

By collating the information over a wide area, meteorologists can observe the behaviour and movement of weather formations that might affect different areas in the future. This allows meteorologists to make weather predictions or forecasts.

There are many different types of weather maps, all drawn using WMO agreed standards and symbols.

The most commonly used chart is the Met Office Surface Pressure Chart.


A *synoptic chart* is one that shows the weather conditions as they actually were for the synoptic hour indicated.

A *prognostic*, or *forecast*, *chart* is one that shows a prediction of how the weather might be at some future synoptic hour.

Consider the following examples that illustrate the aforementioned synoptic features.

The Met Office provide both black and white and colour charts; colur charts show the land more clearly and are easier to interpret.

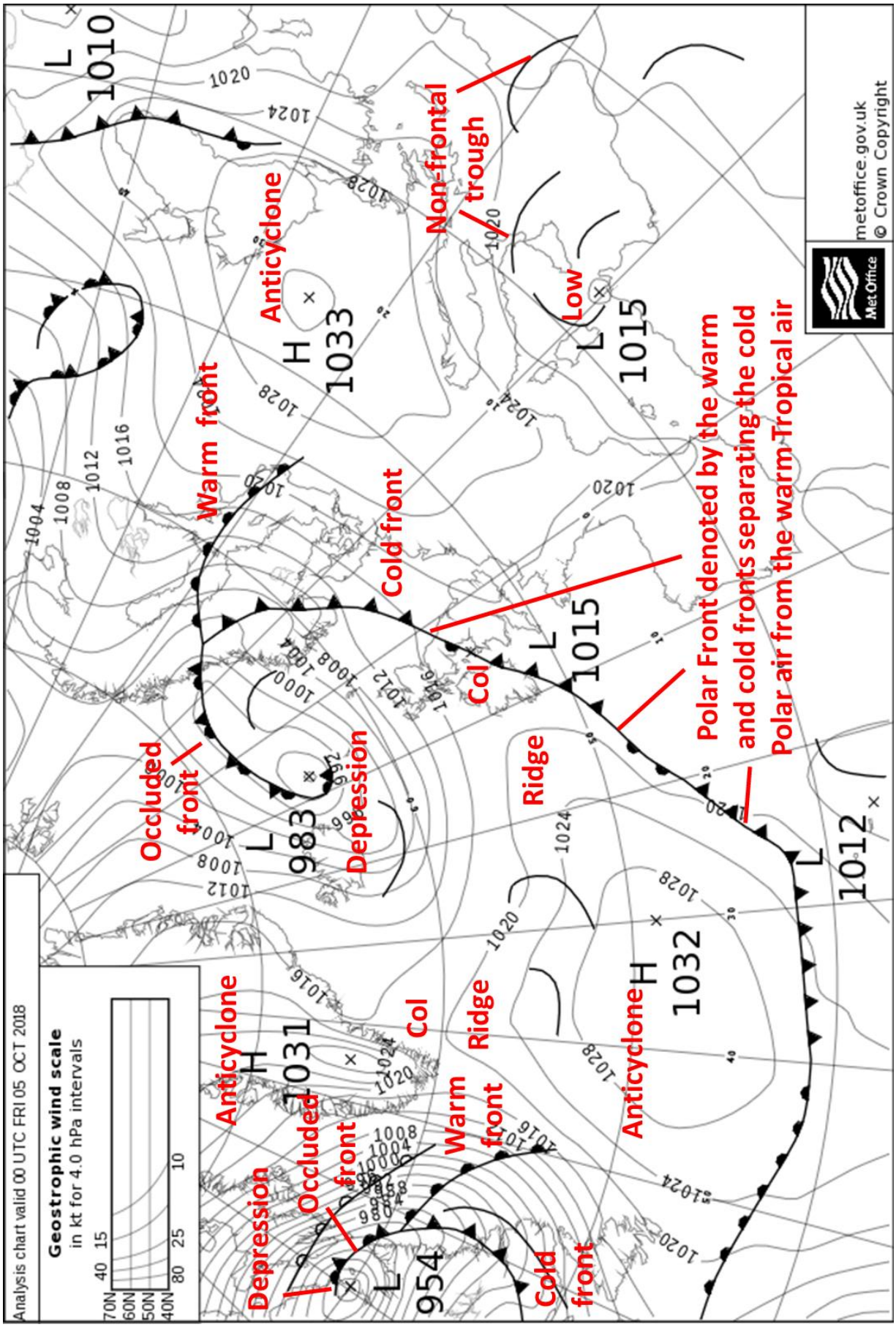


*Fig. 14.7 – Synoptic chart features (black and white).*

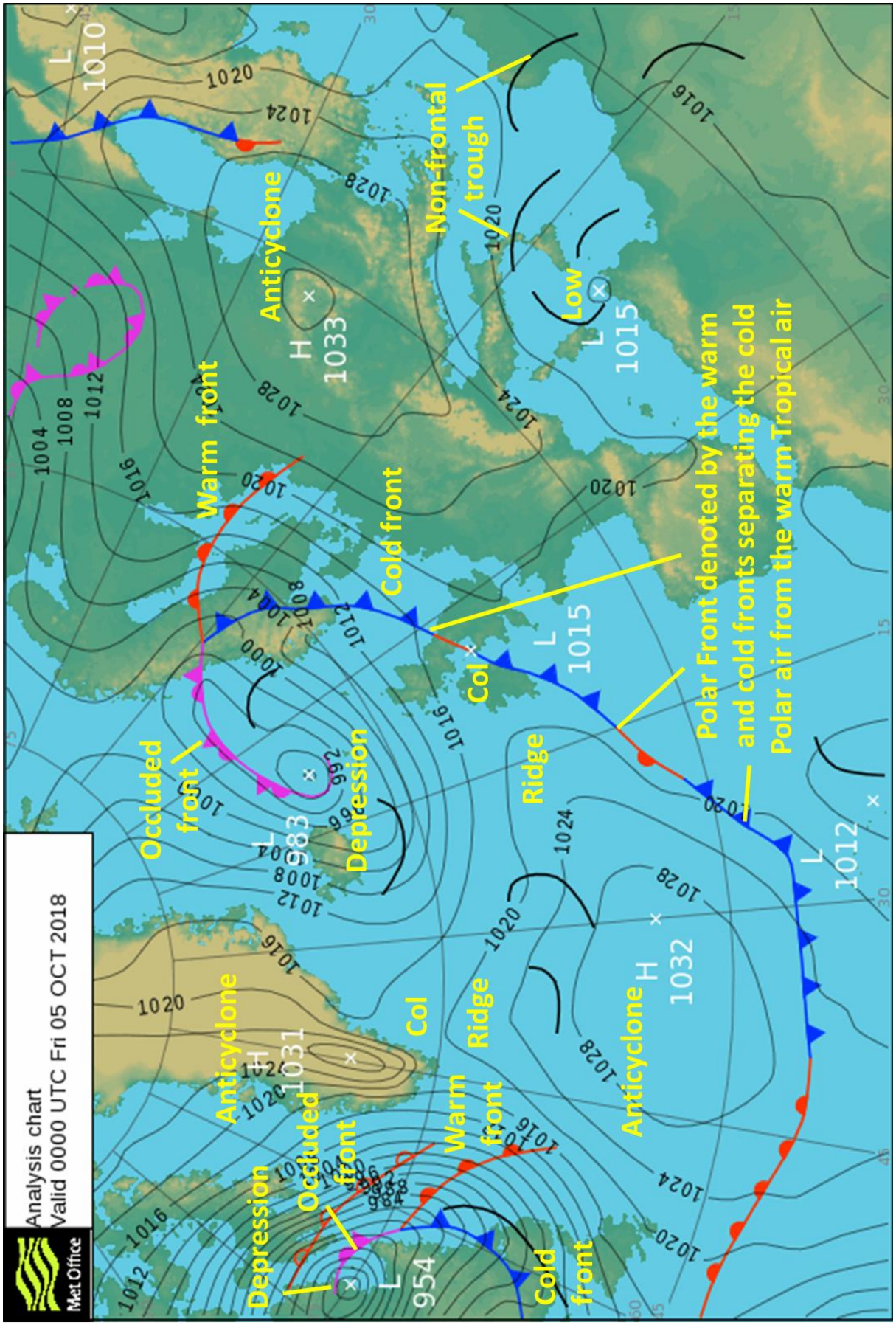


*Fig. 14.8 – The same synoptic chart in colour.*

## 14.7 Weather chart symbols