

4.3 Reading a weather map

Fact sheet objectives

- To outline some basic features of weather maps.
- To outline some tips on how to use weather maps to predict the weather in your area.

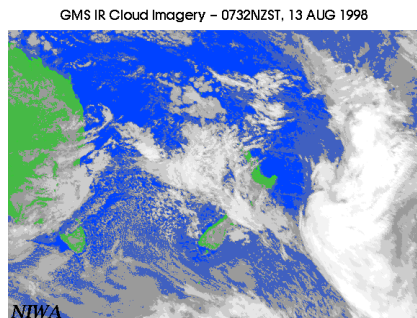


Figure 1 Satellite infrared image of the Southwest Pacific on 13 August, 1998. The 'whiteness' of the cloud indicates cloud height and temperature - very white cloud layers have temperatures of -30 to -40 °C, with the top of the cloud reaching to 7-10 km above the earth. Grey colour indicates lower lying stratiform cloud, often associated with higher pressures and low amounts of rainfall. Shower clouds can be seen in the cellular cloud forms, to the west of the South Island for example. (Source: NIWA).

Reading a weather map.

Two common forms of the weather maps seen on television or in the news media are

- Satellite images showing clear skies and bands of cloud (Figure 1)
- Charts showing atmospheric pressure at mean sea level (MSL) and weather fronts (Figure 2)

The mean sea level chart contains information about the kind of weather that is in progress in the region shown on the chart. Two charts are often shown together - the *analysis* chart which represents the present weather, and the *outlook* chart which represents the forecaster's view of what the weather pattern might be like after a given interval, say 12 or 24 hours.

The main features of a typical weather map are outlined below.

Isobars

The most prominent feature of MSL charts is the plain lines that curve across the map, known as isobars. These are lines of the same (*iso*) barometric pressure, drawn using as much information as possible from land observations, as well as from ship and aircraft reports. Isobars often form closed circles around areas of high pressure (highs, or anticyclones) and areas of low pressure (lows, or cyclones). Often, numbers are shown on the isobars, ranging normally between 985 and 1030, which indicate the atmospheric pressure in hectopascals. In the Southern Hemisphere, winds in anticyclones flow in an anticlockwise 'out spiral', that is the air flows obliquely across the isobars away from the centre of the high (Figure 3). Cyclonic winds flow in the clockwise 'in spiral', obliquely across the isobars towards the centre of the low. When isobars are close together, it's an indication that the winds speeds are relatively high, and the converse is true - relatively low wind speeds - when the isobars are more widely spaced.

Isobars can also extend for thousands of kilometres in lines that don't curve very much, indicating a long, relatively straight air stream.

What the isobars don't show quite so well is how wind speed and direction are affected by New Zealand's rugged topography. Air passing across mountainous terrain flows in eddies around hills,

and strongly through gorges or gaps in the mountains, producing local changes to wind speed and direction that cannot always be shown by the broad isobar pattern.

The isobars also don't tell us what's happening in the upper atmosphere, where temperature and wind structures have a large effect on weather at the earth's surface.

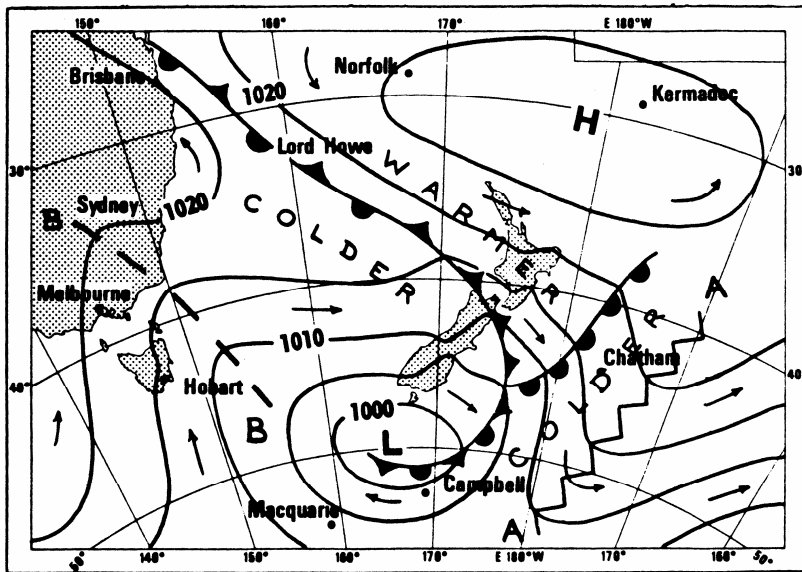


Figure 2 (see text in adjacent column)

Troughs and ridges

Anticyclones and depressions are clearly marked on the weather map with the letters H and L respectively (Figure 2). Ridges and troughs can also be marked on the map, identifiable also by the more abrupt curving of the isobars along these features. The progression of these centres of high and low pressure across the New Zealand region cause the winds to change in direction and intensity, at any given location.

Fronts

Fronts mark the boundary between masses of relatively warm and cold air, and are shown on the map with triangular or semi-circular symbols (Figure 3). When a front passes a place, the air is likely to become cooler or warmer than before, depending on whether a cold front or a warm front respectively is advancing. Note also on the map that some fronts are almost stationary, shown by alternate triangular and semicircular symbols. A final type of front is called *occluded*, when air on either side of the line of the front is of fairly similar temperature.

When is rain likely?

Rain most commonly occurs within bands of cloud associated with depressions. These situations often appear on satellite images as curved cloud bands, stretching out from the centre of the depression. Usually these cloud bands occur along fronts or troughs, and often they are broadest on the eastern and southern side of the low. Most rainfall occurs within these bands, but there are also often showers to the west and north of the low as well (see the schematic example given in Figure 4).

Figure 2. Weather map showing a number of weather systems. The zig-zag line A-A, which is not normally shown on a weather map, marks a ridge of high pressure. The dashed line B-B, also not normally shown, marks a trough of low pressure. The line of triangular symbols over Nelson and Marlborough marks a cold front - the symbols protrude into the warmer air and point in the direction the front is moving, in this case towards the North Island. Colder air follows behind this line.

The line of semi-circular symbols between the North Island and Chatham Islands marks a warm front - the symbols protrude into the colder air and point in the direction the front is moving, in this case towards Chatham Islands. Warm air follows behind this line.

The alternate triangular and semicircular symbols on opposite sides of the isobar mark a stationary front near Lord Howe Island. As with the previous fronts, the triangular symbols protrude into the warmer air, and the semi-circular symbols protrude into the colder air. In this case the front is moving only slowly.

Where alternate triangular and semi-circular symbols appear on the same side of the isobar, this marks an occluded front between the South Island and Campbell Island. The symbols point in the direction the front is moving, in this case towards Campbell Island, but here the air temperatures are much the same on both sides of the front.

Contrary to common expectation, rain can also occur in an anticyclone, particularly if there is a trough or low in the upper atmosphere (which unfortunately is not shown on a surface pressure chart). In summer, thunderstorms can occur in this situation.

Another situation when there might be rain is when there are long straight or slightly curved isobars stretching from some distance offshore on to New Zealand. If there is a range of mountains in the path of the air mass as it comes ashore, there is likely to be cloud upwind of the mountains, and possibly some rain. There is typically little cloud and no rain on the lee side of the range.

Figure 3. Example analysis for 21 June 1976. A deep depression lay just east of the North Island and a slow moving anticyclone over the southwest Tasman Sea extended a ridge of high pressure to the south of the country. The strong cold southerlies between the high and low pressure zones brought widespread snow to low levels over the east of the North Island.

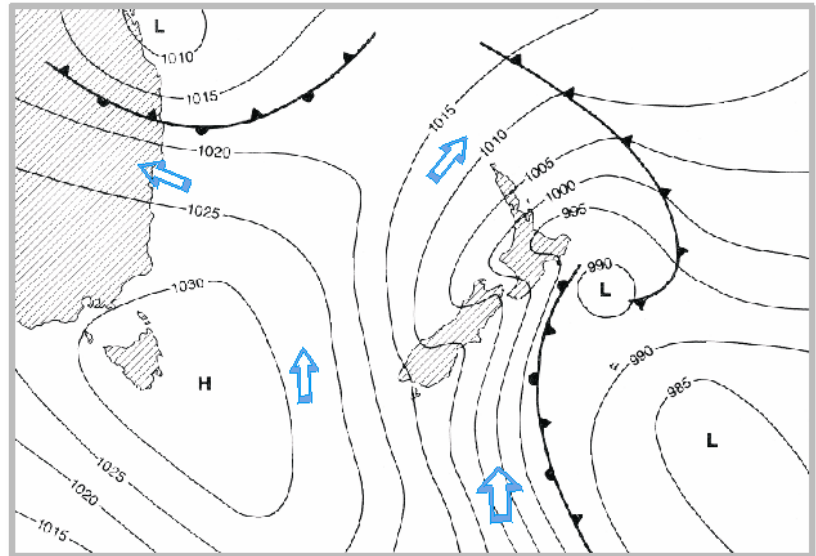


Figure 3 (see text in adjacent column)

Figure 4. Typical cloud sheet in a depression. The speckled area shows where the cloud is thickest, and this area typically forms a band which curves around on the eastern and southern side of the low, in which areas it often becomes broadest. The dashed line encloses an area which often is occupied by shower clouds.

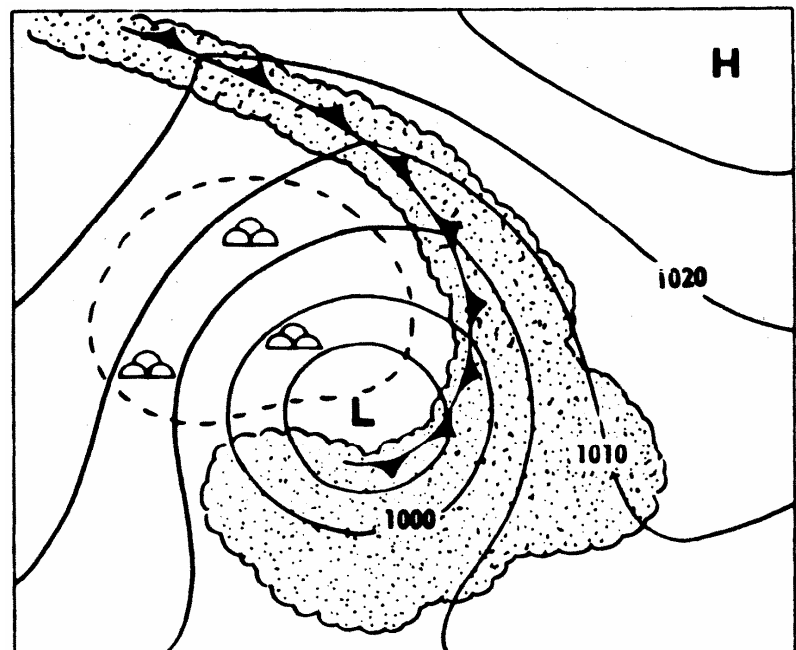


Figure 4 (see text in adjacent column).

Summary Information

- Weather maps we see most are surface pressure charts and satellite images.
- The lines and symbols show the main features of the current or forecast weather, and give clues as to which places are likely to be windy, sunny or wet.
- A sequence of weather maps, combined with local observations, can be a valuable tool in determining typical patterns and developments in your local weather.

Useful Websites

Reading weather maps:

www.metservice.co.nz/learning/forecasting_reading.asp

<http://www.stuff.co.nz/stuff/>

A MAF Sustainable Farming Fund Project:



Materials developed by Hort Research and NIWA

