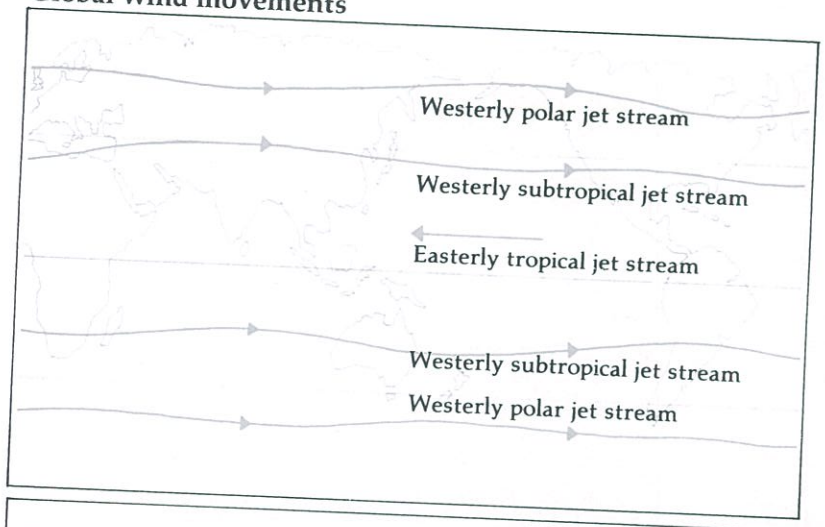
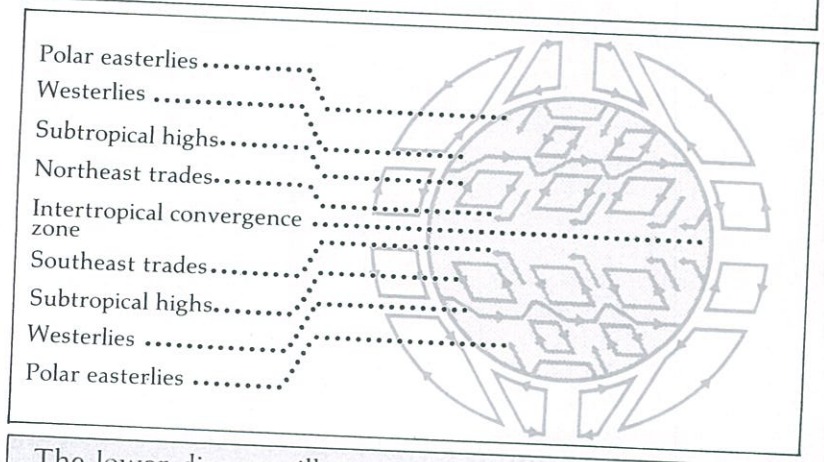
and 40°S. This is known as the subtropical jet stream. As the air flow from the Equator is interrupted by this stream, it piles up to create the subtropical high pressure belt that is a major influence on the weather pattern in New Zealand.

To the south of New Zealand is another great westerly, high level wind stream: the westerly polar jet stream which snakes between latitudes 50°S and 60°S. This is the zone of the Earth where the tropical and polar air masses merge. It is the area where most of the depressions that will affect New Zealand's weather are formed.

Global wind movements





The lower diagram illustrates winds' beginnings at the Equator, journeys to the polar regions and return to the middle latitudes

READING THE WEATHER MAP

Today, satellites provide us with pictures of Earth's atmosphere and we can see the great swirling patterns of clouds around the areas of high and low air pressure over land and sea.

Before the satellite, forecasters were able to draw up weather maps to gain a similar picture. Their main tool was, and still is, the barometer, measuring atmospheric pressure at various points on and off shore. By connecting the points of similar air pressure, the forecaster draws up the weather map which appears each day in your newspaper and on television.

Once you know the meaning of the symbols on the map, you can use it to work out your own weather predictions. The main weather features are the anticyclone (H), the depression (L), the warm front and the cold front. By comparing today's map with the one for yesterday and the day before, you can see how quickly these features are moving across the country and where they are likely to go in the next 24 hours.

THE ISOBAR

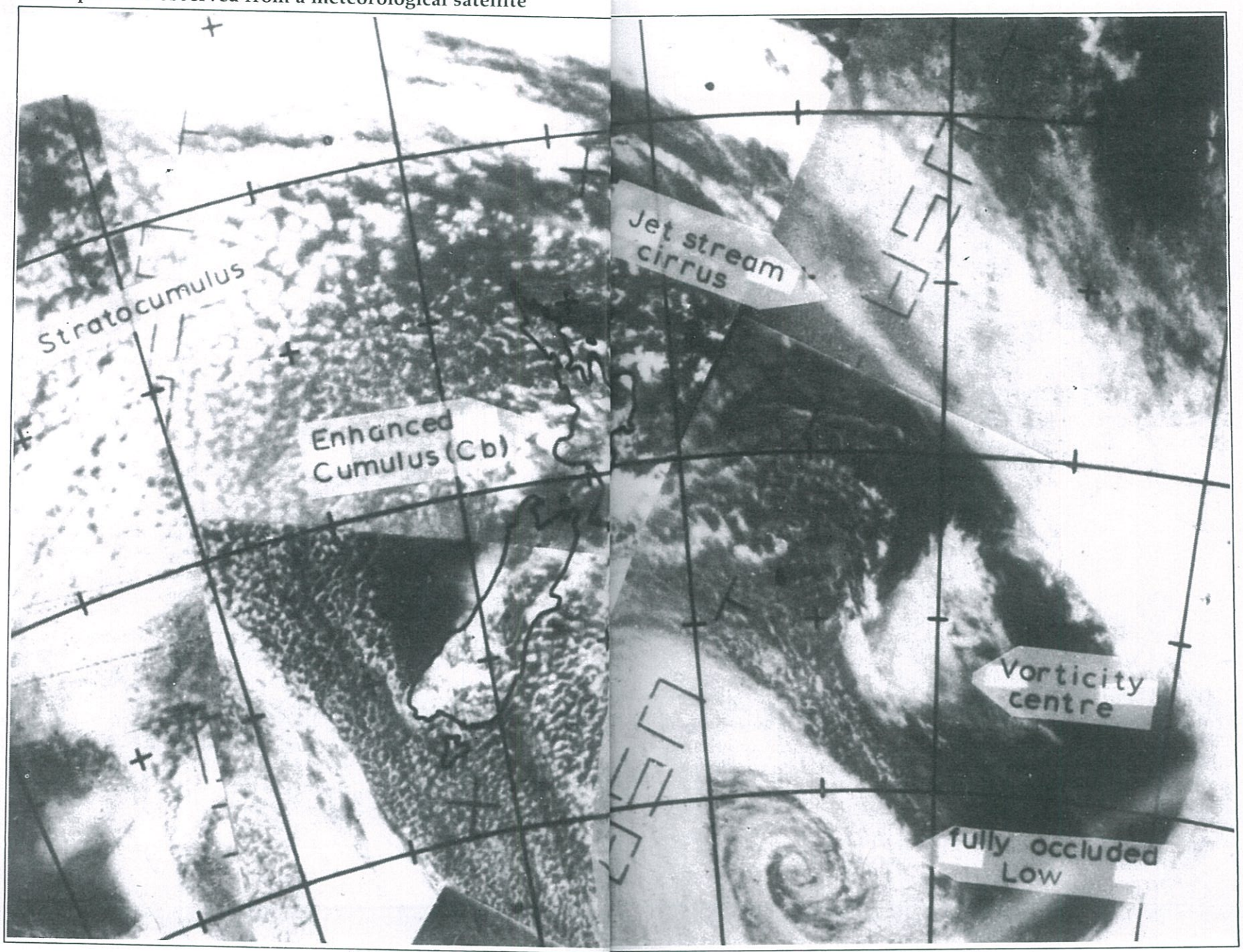
The main weather map symbols are the *isobars*, the fine lines which look like whirlpools. The forecaster draws in the isobars to connect places of equal atmospheric pressure at a set hour.

Readings are taken from barometers at hundreds of observation stations. Each reading is adjusted according to the height of the station above sea level so that a common mean sea level reading is produced for all the observation points. The adjustment is a simple one: pressure decreases with height above sea level at the rate of about 12 hectopascals (or millibars) per 100 metres.

Once the points of equal pressure are joined, a picture emerges of the zones of low and high pressure which will influence our weather. We now have a picture of the depressions, anticyclones and connecting patterns of ridges, troughs, cols and secondary depressions.

The lines of the isobar show the direction of the wind. It circulates clockwise around a depression and anticlockwise around an anticyclone in the Southern Hemisphere and

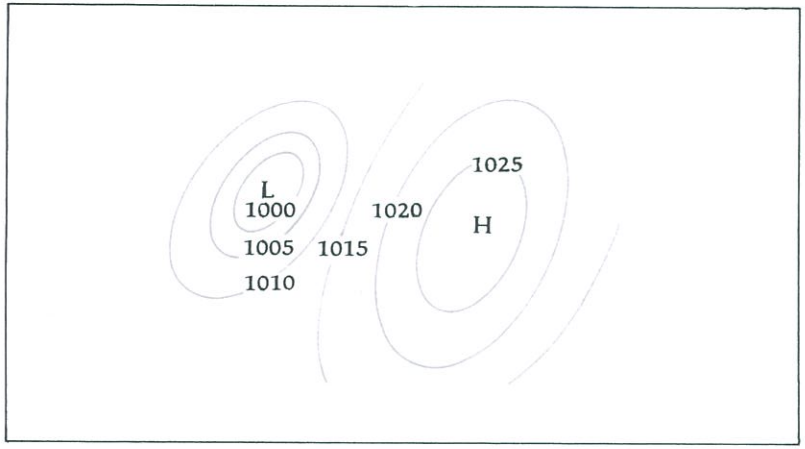
Cloud patterns observed from a meteorological satellite



moves in the opposite direction in the Northern Hemisphere.

Where the isobars are close together, the winds will be strong. Where isobars are widely spaced, the winds are light.

Isobars



THE ANTICYCLONE

The anticyclone (H) is an area of high pressure air. The isobars around an anticyclone will generally be widely spaced. This usually indicates an area of light variable wind and fine weather. However, an anticyclone may also signal cloudy weather with scattered drizzle or fog, particularly in autumn.

THE DEPRESSION

The depression (L) is a zone of low pressure. The tightly spaced isobars indicate strong, squally winds. Clouds and rain are usually concentrated in distinct areas of a depression known as fronts', but the pattern is far from simple.

LOW PRESSURE TROUGHS

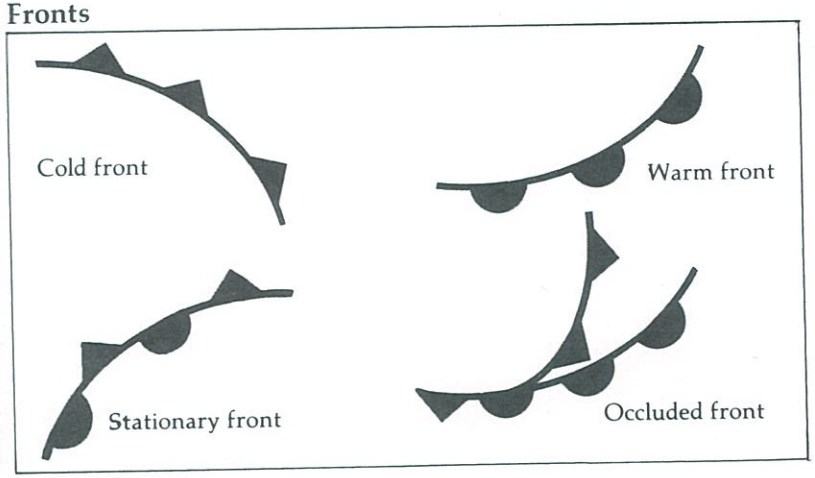
Troughs are long arms of low pressure reaching out from a depression. On the New Zealand weather map, troughs will frequently extend northwest from a depression centred south of the country. There is usually an anticyclone on either side of a trough, and there is likely to be a cold front within the trough. Troughs tend to move from southwest to northeast across New Zealand.

HIGH PRESSURE RIDGES

Ridges are narrow arms of high pressure extending from anticyclones to separate troughs of low pressure from

depressions. They create a narrow zone where atmospheric pressure is relatively higher and are generally accompanied by a brief spell of fine weather.

Fronts



FRONTS

Fronts are boundaries between masses of warm and cold air in a depression.

The *cold front* is shown on the weather map as a heavy line with spikes on one side. The spikes point the direction in which the front is moving. In a cold front, a mass of cold air is advancing and displacing warm air.

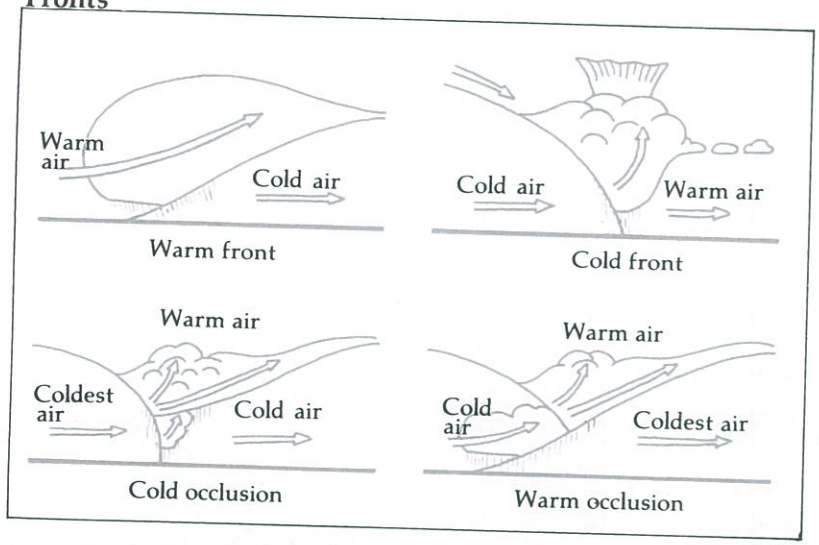
The *warm front* is shown on the map by a heavy line with round lumps on one side. Again, the lumps point the way the front is moving. Warm fronts occur when a mass of warm air is pushing along and over a body of cold air.

When neither the cold air nor the warm air in the depression is moving much, *a stationary front* is formed. This is shown on the weather map by a bold line marked with spikes and lumps on *opposite* sides of that line.

Occlusions or *occluded fronts* occur where one front overtakes another. Cold fronts normally travel faster than warm ones. The result is that the area of the warm front is gradually reduced as the pocket of warm air is squeezed and lifted between the converging masses of cold air. As the warm air is squeezed and lifted it forms clouds and rain.

The occluded front is marked on the weather map by a bold line with alternate spikes and lumps on the *same* side of the line. The spikes and lumps point in the direction in which the front is moving.

Fronts



OTHER WEATHER SYMBOLS

The weather map on television and in the newspapers is a vastly simplified form of the charts produced each day by the New Zealand Meteorological Service.

More detailed maps are available from local offices of the service for those who need more specific weather information. To make effective use of them, you will need to know the meaning of a wider range of meteorological symbols. Here are the symbols used commonly throughout the world, and their meanings.

WIND CONDITIONS

Wind strength is measured internationally by the Beaufort Scale of Wind Force. The table overleaf shows the symbol for each Beaufort number and the wind conditions it indicates.

Cloud forms

Symbol	Type	Symbol	Type
	cumulus		nimbostratus
	large cumulus		stratocumulus
	cumulonimbus		cirrus
	stratus		cirrostratus
	altostratus		cirrocumulus

Table of meteorological symbols

Symbol	Weather condition	Symbol	Weather condition
	rain		glaze
	freezing rain		fog
	drizzle		icy fog
	freezing drizzle		mist
	showers		spray
	snow		haze
	snow pellets	S	dust haze
	snow grains		smoke
	drifting or blowing snow	$	drifting or blowing sand or dust
	drifting snow	$	drifting sand or dust
	blowing snow	$	blowing sand or dust
	hail		sandstorm or duststorm
	ice pellets		wall of sand or dust
	ice prisms		sand or dust whirl
	dew		thunderstorm
	hoar frost	T	thunder
	rime		lightning

Cloud conditions

Symbol	Code number	Cover	Symbol	Code number	Cover
	0	nil		5	5/8
	1	1/8		6	6/8
	2	2/8		7	7/8
	3	3/8		8	8/8
	4	4/8		9	unknown

Beaufort Scale of Wind Force

MAP SYMBOL	BEAUFORT NO.	DESCRIPTIVE TERM	VELOCITY EQUIVALENT* mean velocity in knots	metres/sec	km/h	Land
	0	Calm	1	0-0.2	<1	Calm; smoke rises vertically
	1	Light air	1-3	0.3-1.5	1-5	Direction of wind shown by smoke drift but not by windvanes
	2	Light Breeze	4-6	1.6-3.3	6-11	Wind felt on face; leaves rustle; ordinary vanes moved by wind
	3	Gentle Breeze	7-10	3.4-5.4	12-19	Leaves and small twigs in constant motion; wind extends light flag
	4	Moderate Breeze	11-16	5.5-7.9	20-28	Raises dust and loose paper; small branches are moved
	5	Fresh Breeze	17-21	8.0-10.7	29-38	Small trees in leaf begin to sway; crested wavelets form on inland waters
	6	Strong Breeze	22-27	10.08-13.8	39-49	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty
	7	Near Gale	28-33	13.9-17.1	50-61	Whole trees in motion; inconvenience felt when walking against wind
	8	Gale	34-40	17.2-20.7	62-74	Breaks twigs off trees; generally impedes progress
	9	Strong Gale	41-47	20.8-24.4	75-88	Slight structural damage occurs (chimney pots and slates removed)
	10	Storm	48-55	24.5-28.4	89-102	Seldom experienced inland; trees uprooted; considerable structural damage occurs
	11	Violent Storm	56-63	28.5-32.6	103-117	Very rarely experienced; accompanied by widespread damage
	12	Hurricane	64 and over	32.7 and over	118 and over	—

* *Velocity equivalent at a standard height of 10 metres above open flat ground*

SPECIFICATIONS		Probable wave height in metres
Sea	Coast	
Sea like mirror	Calm	
Ripples with the appearance of scales are formed, but without foam crests	Steerage way	0.1
Small wavelets, still short, but more pronounced; crests have a glassy appearance and do not break	Sails filled	0.2-0.3
Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses	Yachts heel over and travel about 3-4 knots	0.6-1.0
Small waves, becoming longer; fairly frequent white horses	Good working breeze; yachts carry all canvas with good list	1-1.5
Moderate waves, taking a more pronounced long form; many white horses are formed (chance of some spray)	Yachts shorten sail	2-2.5
Large waves begin to form; the white foam crests are more extensive everywhere (probably some spray)	Double reef mainsails; care required when fishing	3-4
Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind	Remain in harbour, if at sea heave to	4-5.5
Moderately high waves of greater length; edges of crests begin to break into the spindrift; the foam is blown in well-marked streaks along the direction of the wind	Heave to or seek shelter	5.5-7.5
High waves; dense streaks of foam along the direction of the wind; crests of waves begin to topple, tumble and roll over; spray may affect visibility	—	7-10
Very high waves with long overhanging crests; the resulting foam, in great patches, is blown in dense white streaks along the direction of the wind; on the whole, the surface of the sea takes a white appearance; the tumbling of the sea becomes heavy and shock-like; visibility affected	—	9-12.5
Exceptionally high waves (small and medium-sized ships might be for a time lost to view behind the waves); the sea is completely covered with long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility affected	—	11.5-16
The air is filled with foam and spray; sea completely white with driving spray; visibility very seriously affected	—	14