READING THE CLOUDS

Clouds do not always mean rain: they are useful indicators of a number of weather prospects. Clouds are formed as warm, moist air rises and cools. As the air rises it is subject to less pressure and expands. When air expands its temperature falls and water vapour in the air begins to condense.

Clouds are made of drops of water and/or ice crystals. It will take as many as 1 million cloud drops to form a raindrop. The water droplet will have to grow to about 1 millimetre in radius before its weight will overcome the lift of ascending air and it is able to fall as a raindrop.

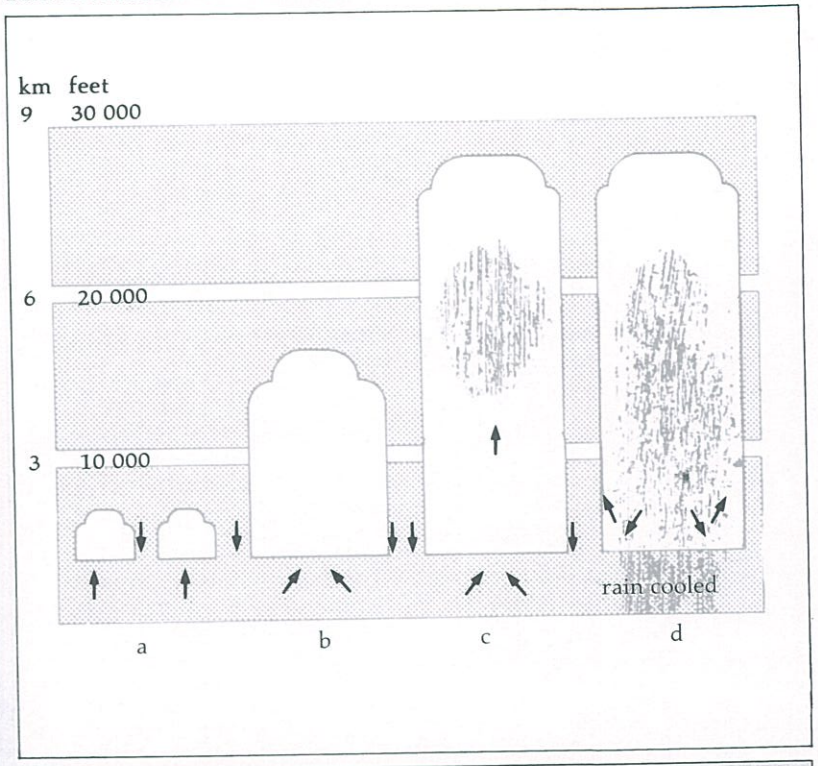
Cloud shapes are greatly influenced by temperature differences between masses of air. When the rising air is warmer than the surrounding air, it continues to rise to form cloud towers (heap cloud). When the rising air is cooler than the surrounding air, it loses its buoyancy and forms layers.

You can learn a great deal about local weather conditions by observing the cloud types overhead. Cloud forms are generally classified into three basic groups — streak, sheet, and heap. Streak usually indicates ice clouds (cirrus types), sheet cloud indicates a slow widespread lifting of air (stratus types), and heap clouds are formed by local rising currents (cumulus types). There are ten recognised basic cloud types:

Cirrus	Streak cloud	Indicates warmer weather coming
Cirrostratus	Layer of streak cloud	Indicates warmer weather coming
Cirrocumulus	Billowy streak cloud	Indicates rain is likely later
Altostratus	Medium level layer cloud	
Altocumulus	Medium level billowy cloud	Indicates rain tomorrow
Stratus	Layer cloud	

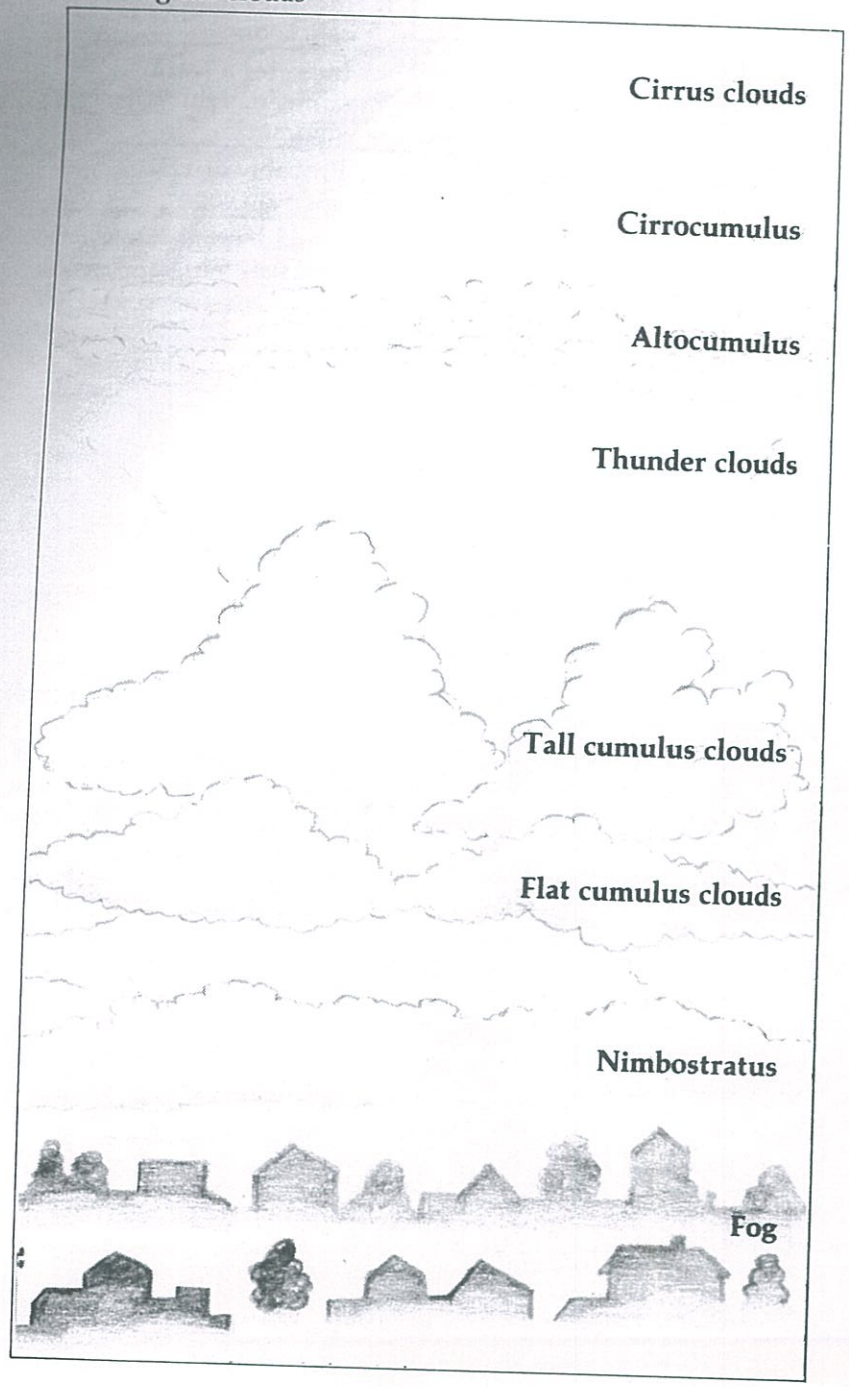
Cumulus	Heap cloud	Indicates heavy rain soon
Stratocumulus	Cross between layer and heap	Indicates a warm sunny day (in summer)
Nimbostratus	Mainly layer cloud	Probably drizzle and rain soon
Cumulonimbus	Mainly heaped cloud	Thunder, lightning and hail

The formation of a shower



Heat is transported upwards; cloud forms when the air reaches condensation level (a). Latent heat derived from condensation helps keep the air buoyant and it continues upwards (b), forming deep shower clouds in which raindrops first form at upper levels (c), and later reach the ground (d)

Reading the clouds



You can get an idea of what the weather will be like by looking at the clouds. Use this guide to help you identify the clouds in the sky. Later, note the weather they have made. You will soon know what weather to expect from different clouds:
Cirrus clouds Very high and wispy. Warmer weather coming
Cirrocumulus Bands of puffy cloud across the sky. Rain coming soon
Altocumulus Small, puffy, white clouds high in the sky. It may rain tomorrow
Thunder clouds Wider at the top than the bottom. Thunder and heavy rain coming
Tall cumulus clouds Heavy rain very soon
Flat cumulus clouds Warm sunny day
Nimbostratus Grey cloud covering whole sky. Probably drizzle and rain soon
Fog is cloud very near the ground

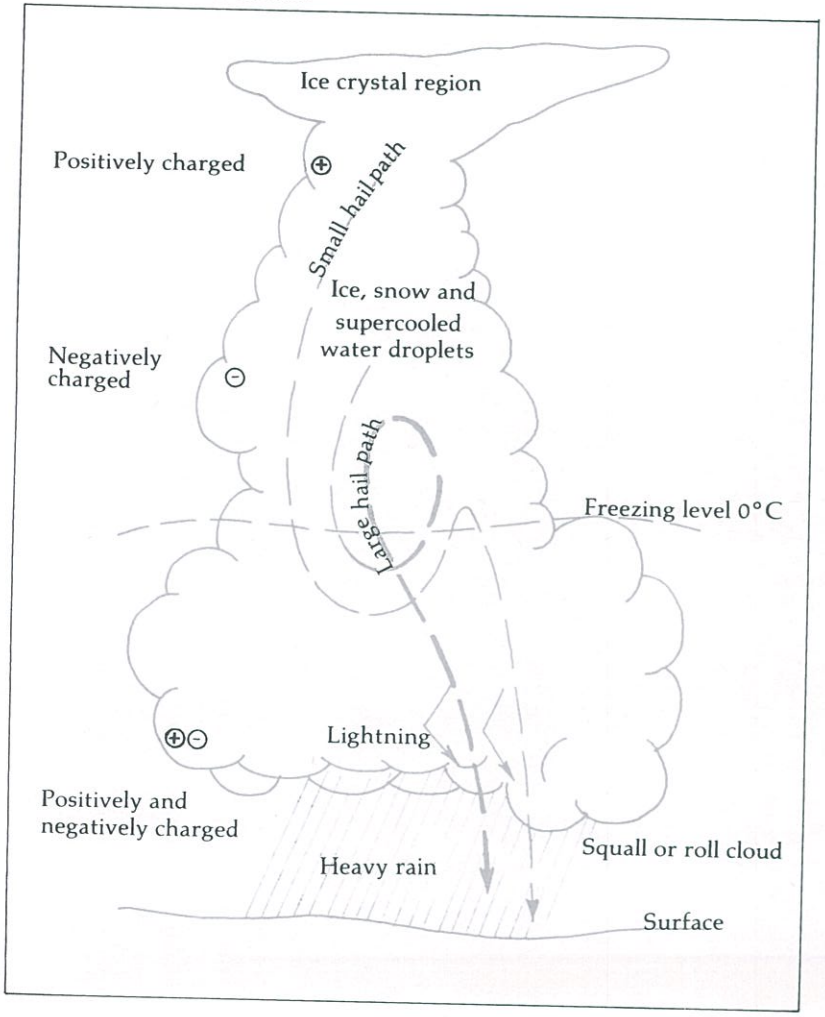
The most dramatic cloud in the sky is the huge cumulonimbus thundercloud. Reaching more than 10 kilometres into the sky, the cumulonimbus cloud is capped by a smooth veil of ice crystals. Its inner working — the mechanism that produces lightning and hail — is still something of a mystery. Its interior is a great swirling mass of rising and falling air and water in various forms from vapour to ice. Air moving in its upward currents may move faster than 10 metres a second, fast enough to prevent even the largest raindrops falling.

There is usually a concentration of positive electrical energy in the upper, frozen portion of the thundercloud, and a concentration of negative charge in the lower regions. Potential differences can be as much as 100 million volts. When the insulating property of the air breaks down, a lightning discharge may pass from cloud to cloud, or from the thundercloud to the ground.

About 25 percent of the lightning will pass to the ground, starting with a leader that flashes down to the earth. Then there is a heavier return stroke back up along the same path traced by the leader flash. The intense heat of the flash causes a rapid expansion of the air along its path, and the collision between this rapidly expanding channel of air and the air surrounding it is what we hear as thunder.

Water will fall from the cumulonimbus cloud in heavy raindrops, or even in frozen form as hailstones. New Zealand's western regions are more prone to thunder and hailstorms. Most places in Westland, Taranaki and Northland experience thunderstorms on 15 to 30 days a year, whereas most places east of the main ranges experience thunderstorms on only about three to five days a year. Severe hailstorms are more likely to occur in eastern districts on the afternoons of the warmer months of the year. The average number of severe hailstorms per year throughout New Zealand is nine, but this number can vary considerably from year to year.

Cumulonimbus cloud



NEW ZEALAND'S WEATHER PATTERNS

The great frontal systems sweeping towards us across the oceans are a major influence on our weather, but our rugged landscape also has a significant effect. At the coast, and over land, clouds are formed through mechanical turbulence, convection, and orographic ascent.

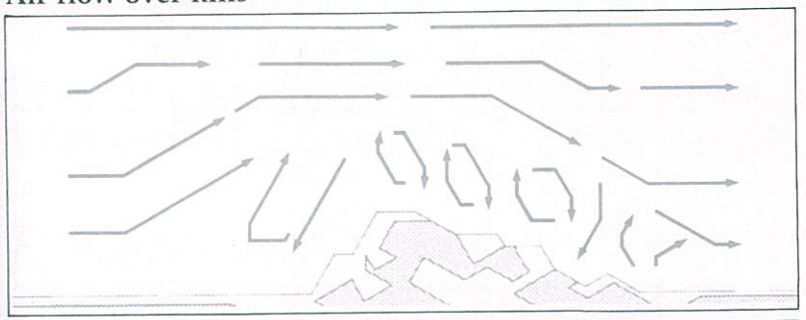
Mechanical turbulence occurs when air flows over the land and is disturbed by obstacles such as buildings, trees, and hills. At a specific point above the ground, water vapour from the turbulent air will condense to form a layer of stratocumulus cloud. Turbulence near Earth's surface can also produce ragged low clouds in the air beneath the main formation.

Convection is the term given to thermal turbulence, which occurs when air is heated by the land or sea. New Zealand's extensive coastal regions are obviously good breeding grounds for clouds formed by convection.

Orographic ascent occurs when moist air rises over a mountain range or barrier of hills. In general, orographic cloud forms continuously on the windward side of hills, but clears away on the lee side.

All these landscape-related processes influence the local climate in New Zealand's distinct weather regions.

Air flow over hills



When it crosses hilly terrain the air flow becomes turbulent. The turbulence is caused by the presence of uneven terrain and the increased frictional drag