thousands of miles of ocean. Our own meteorological service is responsible for providing daily weather information from as far north as the Equator and south to the South Pole, a service covering about one-quarter of the Southern Hemisphere.

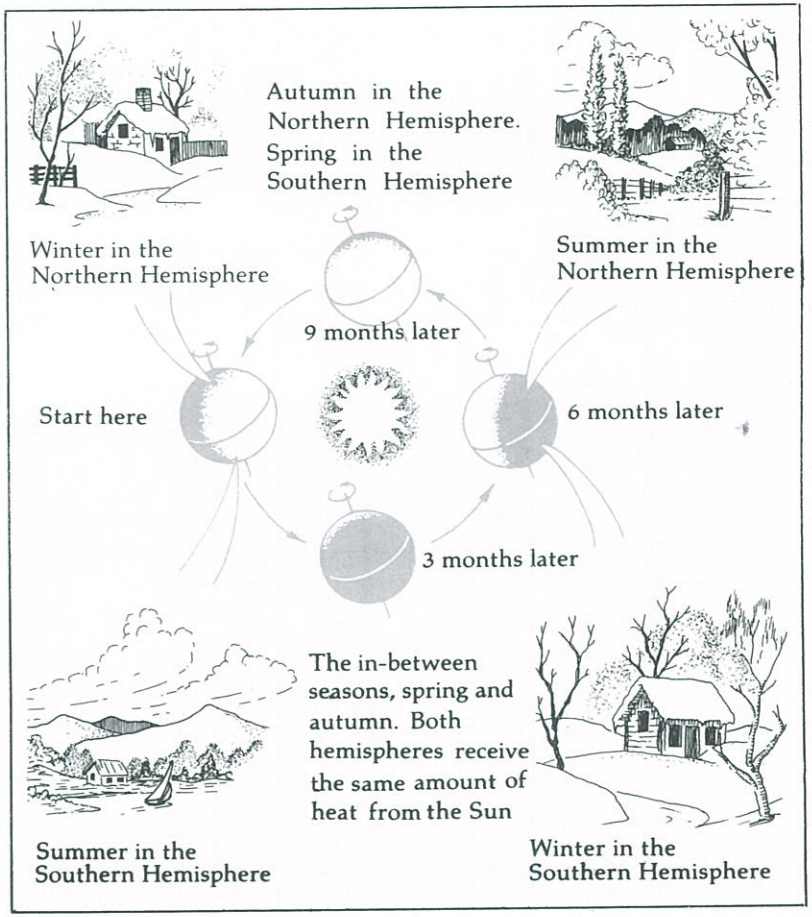
The service's headquarters in Kelburn, Wellington, receives and processes a third of a million figures every day. Each figure says something about one part of the weather in one part of New Zealand and our environs at one time. Added to a file of records dating back to 1853, each figure enhances the service's ability to forecast the weather a day ahead, a week ahead, a season ahead... and beyond.

WHERE DOES THE WEATHER COME FROM?

THE SUN

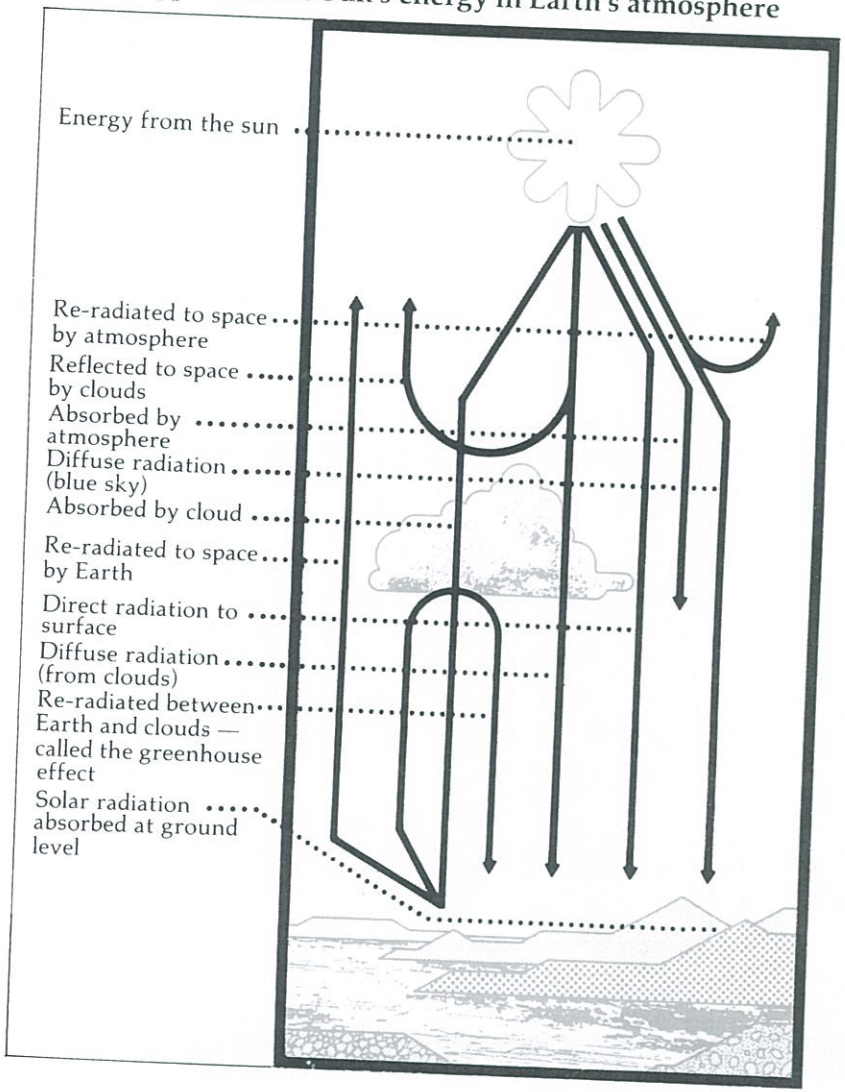
The Sun is the great engine that drives the Earth's 'weather machine . Burning at more than 6000°C at its photosphere, the Sun emits a range of rays that are either converted to heat energy as they encounter the elements in the Earth's atmosphere, absorbed by the surface of our planet, or reflected back.

Earth's journey around the Sun



The Sun heats the surface of the Earth unevenly. The equatorial zone is closest to the furnace at the heart of the solar system and receives more heat energy than the polar regions. There is a daily cycle of heating and cooling as each section of our globe passes out of the Sun's direct light into the shade of night. There are seasonal cycles which occur because the Earth revolves on a tilted axis, 'leaning' first one hemisphere then the other towards the Sun on our annual orbit around it.

What happens to the Sun's energy in Earth's atmosphere



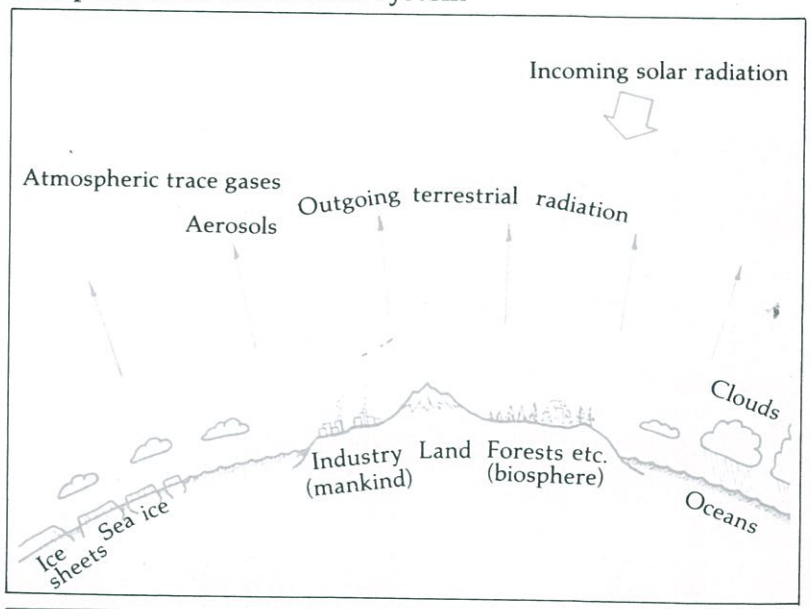
THE ATMOSPHERE

Earth's atmosphere — that ocean of gases over our heads — also acts as a patchy filter, allowing varying amounts of sunlight to reach our planet's surface and varying amounts of Earth's own radiation to escape into space.

Oxygen and nitrogen make up 99 percent of the gases in our atmosphere. There are also small quantities of argon, carbon dioxide, helium, hydrogen, krypton, neon, ozone, radon, and xenon. Each gas selectively absorbs radiation in different wavelengths.

Water vapour in the atmosphere, clouds, dust, the shimmering surface of the sea, and the different textures of the land surface also reflect, scatter, or absorb different amounts of radiation. On average, only about 47 percent of the radiation from the Sun will reach the surface of Earth where it will be absorbed and converted into heat energy.

Components of the climate system



These components interact with each other to a greater or lesser degree, and together they determine the Earth's climate. The burning of fossil fuels, land management practices, and other of mankind's activities may be combining to change the heat balance of the global climate

THE HEAT BALANCE

As a result of all these factors, there are great variations in the air temperature over different parts of our planet. Temperatures at the Equator can be as much as 100°C warmer than they are at the poles.

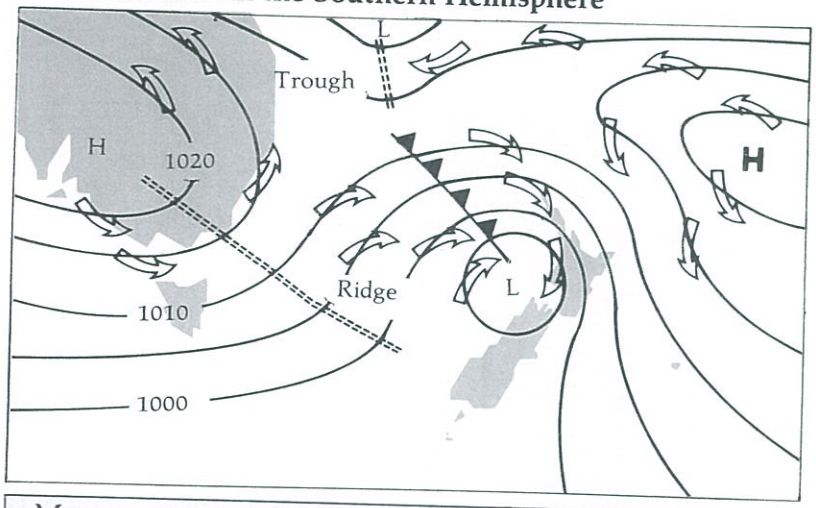
The winds of the world and the currents of the ocean carry out exchanges of heat over the surface of our planet in a never-ending natural process that attempts to balance out the extremes of temperature.

ATMOSPHERIC PRESSURE

Differences in atmospheric pressure will also cause air to flow from one place to another. Atmospheric pressure is highest at the Earth's surface, where the weight of all the atoms and molecules of the gases in our atmosphere bear down most heavily. The higher you go, the less the pressure, because the amount of gases above you diminishes.

As the Earth's surface passes alternately through the Sun's light and shade, the atmosphere expands and contracts as it heats and cools. This expansion and contraction is one process that causes atmospheric pressure to rise and fall in different places around our planet.

Air movements in the Southern Hemisphere



Movement is anticlockwise from high pressure areas (anticyclone) to low pressure areas (cyclone). Elongated sections of anticyclones are called ridges and sections between lows are called troughs

The same factors that complicate the balancing of temperatures over the surface of Earth (such as water vapour, clouds, winds) also complicate the balancing of pressures.

An area of relatively high pressure is known as an anticyclone or 'High'. In the Southern Hemisphere, air circulates around a high pressure area in an anticlockwise direction.

An area of low pressure is known as a depression or 'Low'. In the Southern Hemisphere, air circulates in a clockwise direction around a low pressure area. In general air will move towards areas of lower pressure.

WATER VAPOUR

As well as temperature and air pressure, the other major element in Earth's 'weather machine' is water vapour. Water vapour cycles up continuously from Earth's surface into the atmosphere and back to the surface. It enters the atmosphere by evaporation from the oceans, seas, lakes, and rivers, and by transpiration from Earth's green vegetation.

The amount of water absorbed into the atmosphere varies with temperature, air pressure, and wind. More water can be absorbed into the atmosphere when temperatures are high and pressures are low.

Once air becomes saturated with water vapour, any cooling will produce condensation (into clouds) and eventually precipitation (rain).

THE EQUATOR

The tropics are often described as the birthplace of Earth's weather, the zone where temperatures are high and pressures low. The Sun's heat is most intense over the substantial stretches of sea and ocean in the equatorial belt.

As the Sun's rays heat the air over the Equator, vast quantities of water vapour are gathered up and begin to circulate north and south towards the colder polar zones. The outward migration of hot air creates a low pressure zone along the tropical latitudes known as the 'doldrums'. Air is drawn continuously into this zone of low pressure to replace the moist warm air that is moving up and away.

About latitudes 30°North and South, the poleward circulation of the air is interrupted by great westerly wind streams, generated by the coriolis force of the Earth spinning from west to east on its tilted axis.

A great westerly air stream meanders at high altitudes around the Southern Hemisphere between latitudes 20°S