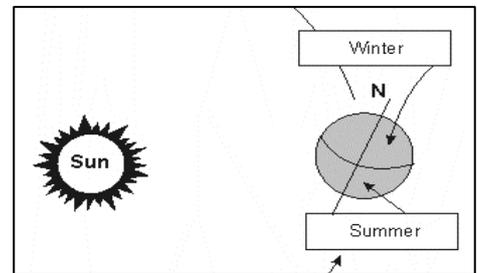


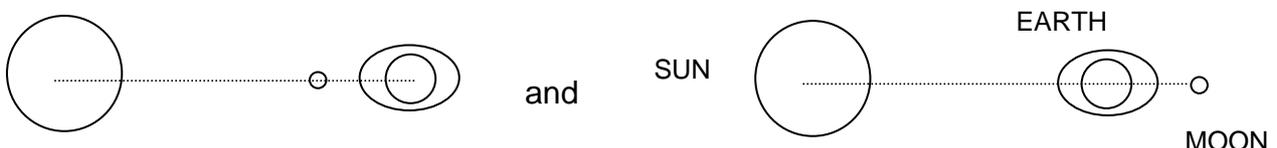
## Environment

### The Earth in Space

- ❑ Earth is the 3rd planet from the Sun. Earth is between Venus and Mars. Our planet takes just over 365 days to orbit the Sun – the basis of our calendar year. A gravitational force of attraction keeps the Earth in its orbit around the Sun. The Earth's axis is tilted at an angle of 23.5 degrees.
- ❑ The Earth has seasons because the Earth's axis (the imaginary line that goes through the North and South Poles) is tilted. As the Earth goes around the Sun, sometimes the southern hemisphere is tilted toward the Sun, and sometimes away. We get summer in the southern hemisphere between December and February, because the southern hemisphere is tilted toward the Sun around that time. This means that we have longer days, so we get lots of sunlight, and the sunlight that we get is hitting us more directly than during the winter. All of this energy means the summer is hot. At the same time, the northern hemisphere is tilted away from the Sun. So they have shorter days (in fact, at the North Pole, there is no sunlight for many months) and the sunlight that they get is very indirect. Then in the autumn months in the southern hemisphere, we are not really tilted toward or away from the Sun, then in June-August, we are tilted away from the Sun in the southern hemisphere (while they have summer in the northern hemisphere). Finally in the spring in the southern hemisphere we are back to no tilt towards or away. Summer is NOT because “one part of the world is closer to the sun” in summer! There would be no seasons at all if the Earth was not on a tilt.



- ❑ We get night and day because the Earth turns/rotates on its axis. Over the course of 24 hours, the planet spins once around its 'axis'. When we're facing the Sun, the sky is light and it is daytime. Then we turn away from the Sun and it is night.
- ❑ Solstices occur when the Sun reaches its Northernmost and Southernmost points. The summer solstice is the longest day of the year (the time between sunrise and sunset on this day is the greatest). The winter solstice is the shortest day of the year
- ❑ Equinoxes are the points in spring and autumn (when the Sun's path crosses the equator), when day and night are approximately equal in length.
- ❑ Tides are caused by the Earth's rotation and the gravitational pull of the Moon. Tides are periodic rises and falls in the ocean level. The gravitational interaction between the Earth and the Moon causes the oceans to bulge out (high tide) in the direction of the moon. Another bulge occurs on the opposite side, since the Earth is also being pulled toward the moon (and away from the water on the far side). Two tides occur each day since the earth is rotating while this is happening.
- ❑ Spring tides are very strong tides (and have nothing to do with the season “Spring”). They are when the Earth, the Sun, and the Moon are in a line. The gravitational forces of the Moon and the Sun both contribute to the tides. Spring tides occur during the new moon and the full moon. (The distances are NOT to scale and the tides have been exaggerated!)



- ❑ Neap tides are very weak tides. They are when the gravitational forces of the Moon and the Sun are at right angles to one another (with respect to the Earth).



## Our Atmosphere and Weather

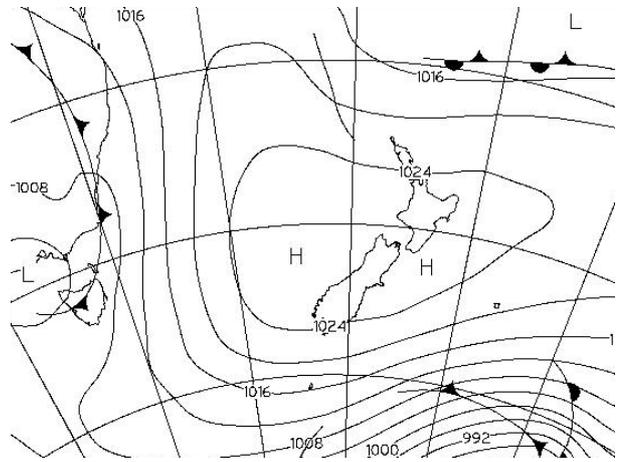
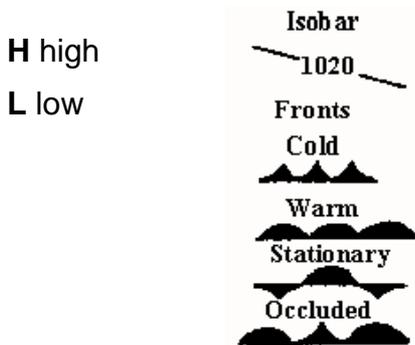
- ❑ Air is a mixture of gases, consisting of nitrogen (80%) and oxygen (20%) plus small amounts of carbon dioxide, water vapour and other gases.
- ❑ The atmosphere consists of three layers, the troposphere (lowest), the stratosphere and the ionosphere.
- ❑ Water is essential to life. Water dissolves many substances with which it comes into contact. Water is treated before we drink it to make it clean, free from bacteria and pleasant to taste. Sewage is collected and cleaned at a waste water treatment plant before it is returned to the environment.
- ❑ Water evaporates from the surface of the earth, condenses and returns as rain, hail and snow. This is called the water cycle. Heat from the sun evaporates the water. Evaporation is the process in which liquid water becomes water vapour (a gas). Water vaporises from the surfaces of oceans and lakes, from the surface of the land, and from plants. Water is lost from plants by evaporation in a process called transpiration. As it cools water vapour in the air turns into liquid water in the process called condensation. The condensed water forms clouds in the sky. Water (in the form of rain, snow, sleet, or hail) falls from clouds in the sky in a process known as precipitation.
- ❑ Cloud types. A cloud is a “visible aggregate” (clump) of tiny water droplets and/or ice crystals suspended in the atmosphere and can exist in a variety of shapes and sizes. Some clouds are accompanied by precipitation; rain, snow, hail or sleet. Clouds come in many different shapes and sizes.

Cirrus	Cumulus	Stratus	Cumulonimbus
High wispy clouds	Fluffy clouds	Clouds spread over the sky in layers	Sometimes a Cumulus cloud can grow into this - often cause rain
			

Clouds formed at ground level are called fog.

- ❑ Weather is the atmospheric conditions experienced by a place over a short period of time, such as a day.
- ❑ Climate is the weather conditions of a place or region averaged over several decades. Our climate and weather patterns change with the seasons.
- ❑ Weather depends upon the movement of high-pressure systems (highs/anti-cyclones) and low-pressure systems (lows/depressions). These usually move from west to east across New Zealand. The “fronts” can result in sudden changes of weather.

- ❑ Fronts mark the boundary between warmer air on one side and colder air on the other, and there is usually a band of cloud and rain with each front. A cold front is when cold air is advancing; a warm front is when warm air is advancing. A front that is not moving very much is called a stationary front.
- ❑ Where the air pressure is lower than anywhere else it is called a low or depression and it is shown as a L on weather maps. Where the pressure is higher it is called a high or anticyclone, and shown using an H. Weather maps that show isobars can be used to predict wind speed and direction. Winds generally blow parallel to isobars. Winds blow in a clockwise direction around a low (L). Winds blow in an anticlockwise direction around a high (H). The closer the spacing of the isobars, the faster the wind speeds.
- ❑ Wind happens as air moves from an area of low pressure to an area of high pressure. Winds can be classified according to their strength, and direction. We measure the strength of wind as a speed in kilometres per hour – km/h. The wind direction e.g., northwest indicates where the wind has come from.
- ❑ Weather data is collected from all over the world and collated onto charts (weather maps). Common symbols are used, so meteorologists can easily read weather conditions.
- ❑ Symbols used on weather maps



- ❑ New Zealand's mountain ranges have a large influence on localised effects of the weather. Gaps between land masses will usually result in stronger winds (eg Wellington and Cook Strait).
- ❑ The mountain chain extending the length of the country has a major effect on the NZ climate, and there is a much bigger climate contrasts from west to east, than from north to south. In some inland areas of the South Island, east of the mountains, the climate is very 'continental' in character, while the west coast is very wet.
- ❑ A cyclone has strong winds and heavy rain. It can cause: wind damage to house, power, stock losses, erosion, flood damage to houses and roads, fallen trees, debris on roads, silting of land and even loss of life.

### Erosion

- ❑ Soil erosion occurs when soil is broken up by raindrops, and carried away by running water. Soil can be blown away by winds during a drought. Farmers make efforts to decrease the effects of wind and water erosion in order to retain the fertile topsoil.
- ❑ Some of the problems include landslips and eroded material on roads, increased water run off hillsides and wind blowing dirt and dust around. Likely causes of landslips are: steep land, loose soil, waterlogged land, rivers/streams cutting into banks, heavy rain, stock damage to land and rabbits/rabbit burrow, cutting down trees in hillsides so their foliage no longer breaks up the rain and their roots no longer hold the soil.

- ❑ Landslips could be fixed by cutting terraces in the slopes, sowing grass, covering with wire mesh, building a retaining wall or putting drainage in the bank.
- ❑ Rivers can wear away river banks causing the land to be eroded. Things that could be done to stop the riverbank being worn away include: Planting trees so roots hold the soil; Change course of river, e.g. straighten it; protecting the bank with boulders / concrete; building stop banks or a dam to prevent flooding.
- ❑ Sand dunes at the beach can be badly eroded. This can be reduced by: planting plants like marram grass to stop the erosion by plant roots holding the sand; putting up wind breaks using netting or low fences to lessen the spread of sand; preventing people from riding bikes there to reduce damage and let plants grow.

## Global Issues

- ❑ The ozone layer is a protective layer in the atmosphere, about 15 miles above the ground that absorbs some of the sun's ultraviolet rays, and reduces the amount of potentially harmful radiation that reaches the earth's surface. Ozone levels in the atmosphere are normally 300 Dobson Units. Each year an ozone hole develops over Antarctica. An ozone hole is defined as an area in which the concentration of ozone is less than 220 Dobson Units. Human activities have damaged this protective shield. Chlorine as chlorofluorocarbons (CFCs) have been put into the atmosphere by human activities: use of certain types of aerosol sprays, fly killer and coolant in refrigerators. This form of pollution has damaged the ozone layer and caused large holes in it. Less protection from ultraviolet light will, over time, lead to higher numbers of skin cancers, more people getting cataracts and sunburn as well as crop damage. Crops are damaged because the UV affects the chlorophyll and enzymes involved in photosynthesis (the process that absorbs light and use its energy to turn carbon dioxide and water into sugar). The hole in the ozone layer often gets confused by people with the problem of global warming. Although there is a connection because ozone contributes to the greenhouse effect, the "Ozone Hole" is a separate issue.
- ❑ Global warming is caused by a natural process called the greenhouse effect combined with another type of pollution. This involves the increase by humans of carbon dioxide levels and some other gases such as methane. These are called greenhouse gases. The extra carbon dioxide formed absorbs and traps sunlight (or more precisely the re-radiated sunlight energy from the Earth's surface) rather like a greenhouse. Burning fuels releases carbon dioxide in to the atmosphere. Increasing the number of farm animals increases the amount of methane (produced by the animals when they digest food). The effects are predicted to be dramatic e.g. rising sea levels as polar ice melts causing flooding in low lying land, and more energy in the global weather system leading to more frequent violent weather patterns and climate change.