



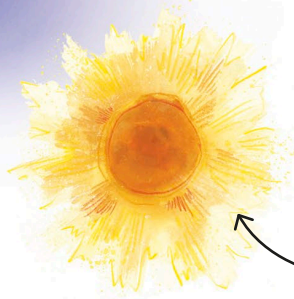
Weather

Explore nature with fun facts and activities



On cold nights, plants may get so cold that moisture in the air freezes onto them instantly, instead of forming liquid dew. This is called hoar frost.

Lightning flashes between the bottom of the thundercloud and the ground.



Sun



Igloos are dome-shaped houses built of solid blocks of snow.



"Wet" snow makes good snowballs.



Weather

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Contents

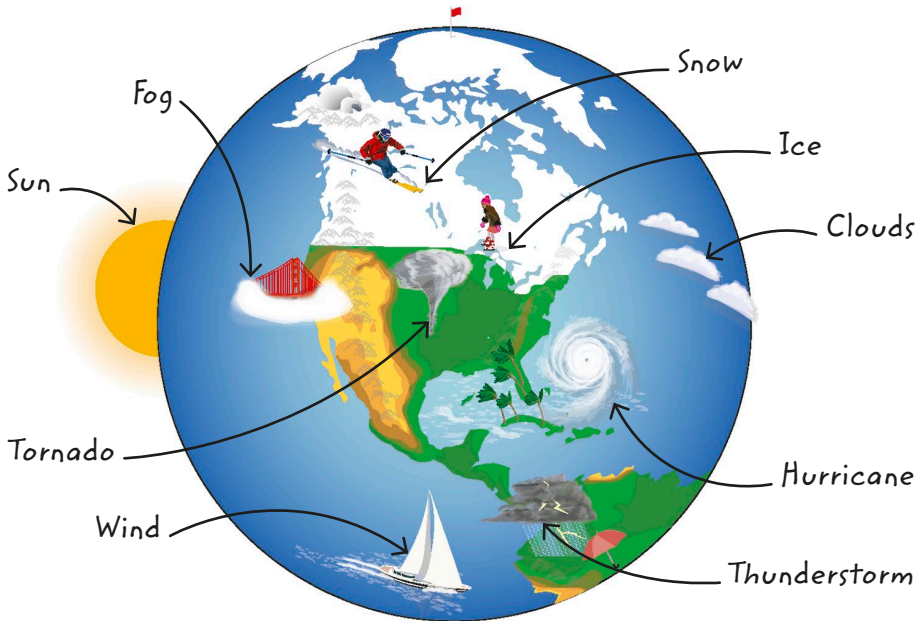


8	What is weather?	36	Hot weather
10	The seasons	38	Dry weather
12	The three clouds	40	Monsoon
14	Cloudspotting	42	A warm front
16	Wet air	44	A cold front
18	Rain and drizzle	46	Thunder and lightning
20	Raindrops	48	Colours in the sky
22	Fog and mist	50	Changing weather
24	Frost and ice	52	Pollution
26	Snowy weather	54	Weather lore
28	From breeze to gale	56	Weather forecasting
30	Under pressure	58	The day
32	Superwinds	60	Index
34	Twisters	61	Acknowledgements



What is weather?

Weather is just the way the air around you changes all the time. It can be still, moving, hot, cold, wet, or dry. Most importantly, weather is the way water changes in the air. Without water, there would be no clouds, rain, snow, thunder, or fog. The weather plays a big part in our lives and affects many of the things that we do.



Weather places

Weather is different in different parts of the world. In deserts, for instance, it very rarely rains, while in tropical jungles, it is hot and steamy. Climate is the usual kind of weather that a place has over a long period. For example, the Arctic has a cold climate.

The atmosphere

Our planet is surrounded by a thin blanket of gases called the atmosphere. Weather only happens in the very lowest layer, the troposphere.

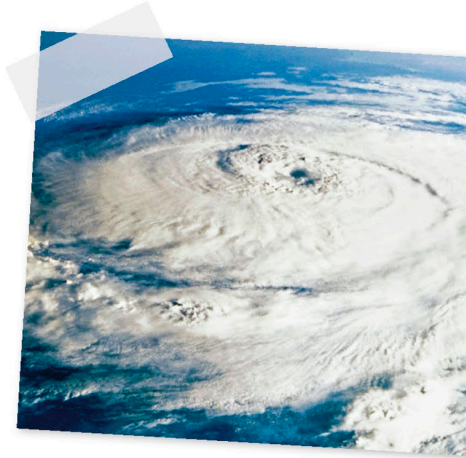
Satellites are stationed in the exosphere, 1,000 to 500 km (620 to 310 miles) from Earth.

The thermosphere is between 500 and 85 km (310 and 53 miles) from Earth. Here, you'll find the aurora lights and the International Space Station.

The mesosphere is between 85 and 50 km (53 and 31 miles) from Earth. Some of the ozone layer and meteorites are found here.

The stratosphere is between 50 and 12 km (31 and 7 miles) from Earth. Nacreous clouds sometimes appear in the lower level, and passenger planes often fly this high.

All our weather happens in the troposphere.



Weather forecasts

Weather experts use satellites to help them make more accurate forecasts. This satellite photograph shows a hurricane over an ocean.

The Ancient Greeks used to think that wind was the Earth breathing in and out. Now we know it is simply air on the move.

The seasons

You can expect a certain kind of weather at certain times of the year. Winter days are often bitterly cold or stormy, while summer days may be warm and sunny. It all depends on the season. Some places have just two seasons, a wet one and a dry one. Other places have four: spring, summer, autumn, and winter.

Spring

Once winter is over, the Sun climbs higher in the sky, and the days get longer. Nights are cold but days can be warm.



Winter

Winter is the coldest time of year. The days are so short and the Sun hangs so low in the sky that the air barely warms up.



Hot Christmas

Because of the way the seasons work, winter happens in the United States when it is summer on the opposite side of the world, in Australia.



Cold winters bring snow.

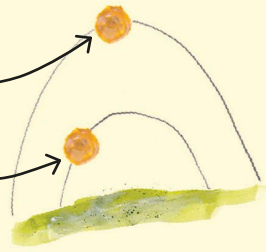


Flowers grow in summer sunshine.



Summer Sun

Winter Sun



High and low

The seasons occur because the amount of sunlight reaching you varies. In summer, you will see that the Sun is much higher than in winter. This means that your part of the Earth is tilting towards the Sun.



Summer

The Sun is high in the sky at noon, and days are long and warm. Hot weather may be broken by thunderstorms.

Autumn

During autumn, the nights get longer and cooler again. Mornings are often misty. Sometimes they are frosty.

Autumn usually brings mists.

Winter sleep

Many animals, such as dormice, sleep away the winter to save energy. This is called hibernation.



The three clouds

Clouds come in all kinds of shapes and sizes, but they are all made of billions of tiny water droplets or even ice crystals floating in the sky. There are three basic types – wispy “cirrus” clouds, fluffy white “cumulus” clouds, and huge blankets of “stratus” clouds.



Cirrus clouds

Feathery cirrus clouds form very high up in the sky. It is so cold up there that they are made not of water droplets, but of tiny ice crystals.

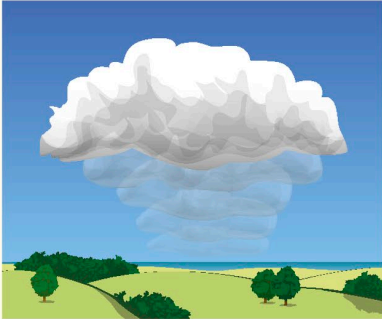
Cirrus clouds high up in the sky often signal bad weather.

Mare's tails

Cirrus clouds are often called mare's tails, because strong winds high in the air blow them into wispy curls – just like the tail of a horse.

What makes a fluffy cloud?

Cumulus clouds form when sunshine warms up bubbles of moist air and causes them to rise quickly. As they get higher, they swell and are cooled so that the moisture turns into a mist of water droplets.



This cloud's fluffy shape shows how the bubble of warm, moist air billows out.

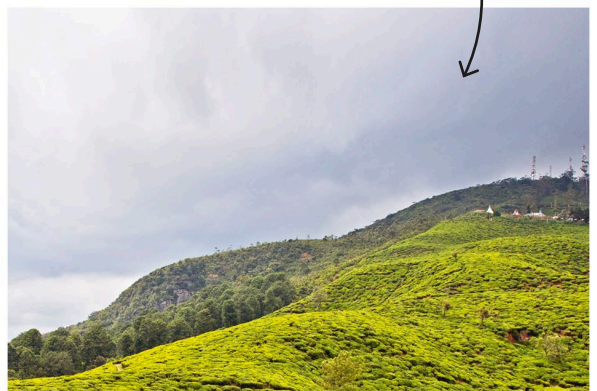
Cumulus clouds

Fluffy cumulus clouds are the clouds you usually see in fine weather, when the sky is blue. They look like heaps of cotton wool and are always changing shape. They are about 500 m (1,640 ft) above you.

Stratus clouds build up when warm, moist air rides up slowly over a bank of colder air.

Stratus clouds

The word “stratus” means “layers” in Latin, but you rarely see the layers in a stratus cloud. You just see a huge grey sheet of low cloud that can stretch for hundreds of kilometres.

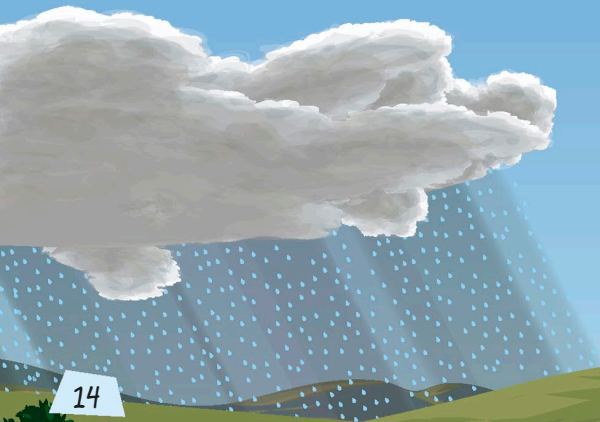


Cloudspotting

Clouds come in many shapes and sizes – some large and fluffy, some small and wispy. It all depends on whether they are formed from water droplets or ice crystals. Weather experts identify clouds by how high they are in the sky, and whether they are layered (stratus) or in heaps (cumulus).

Nimbostratus

These thick layers of cloud start near the ground and can be very tall. They can bring hours of rain or snow.



Cirrostratus

Clouds that form very high in the sky always start with the word “cirro”. Cirrostratus clouds are made of ice crystals.



Altostratus

Medium-height clouds start with the word “alto”. Altostratus is a layer of cloud made of water droplets.



Stratus

Thick layers of stratus cloud hang close to the ground. Sometimes the Sun can be seen through them, looking like a silver disc.



Cirrocumulus

These tiny balls of icy cloud often form what is called a “mackerel sky”, because they look like the scales of a mackerel fish.



Cirrus

Cirrus tend to be the highest clouds of all. They form streaks across the sky that tell of strong winds blowing. They are a sign of unsettled weather.



Alto cumulus

These are medium-height cumulus clouds. They look like flattened balls of cotton that are almost joined together.

Cumulus

Fluffy cumulus clouds are easy to spot. These low-level clouds sometimes develop during the day and get bigger, giving showers.



Cumulonimbus

These are the towering clouds that give us thunderstorms and even tornadoes. A big one may be taller than Mount Everest!



Stratocumulus

If you see long rolls of these medium-height clouds, this usually means fair weather is on the way. They are made by cumulus clouds spreading out in layers.

Wet air

You might not know it, but you're sitting in a sea of water. Like a sponge, air soaks up invisible water vapour. All air contains water vapour, but how much it holds – the air's "humidity" – depends on how hot and dry it is where you are.

Wet breath

When you breathe out, you fill the air with water vapour. If the air is very cold, the vapour turns into millions of tiny water droplets and your breath looks "steamy".



Dew wonder

If air cools down, it can hold less water. After a cool night, leaves and grass are often covered in drops of water, or dew, that the air could not hold.



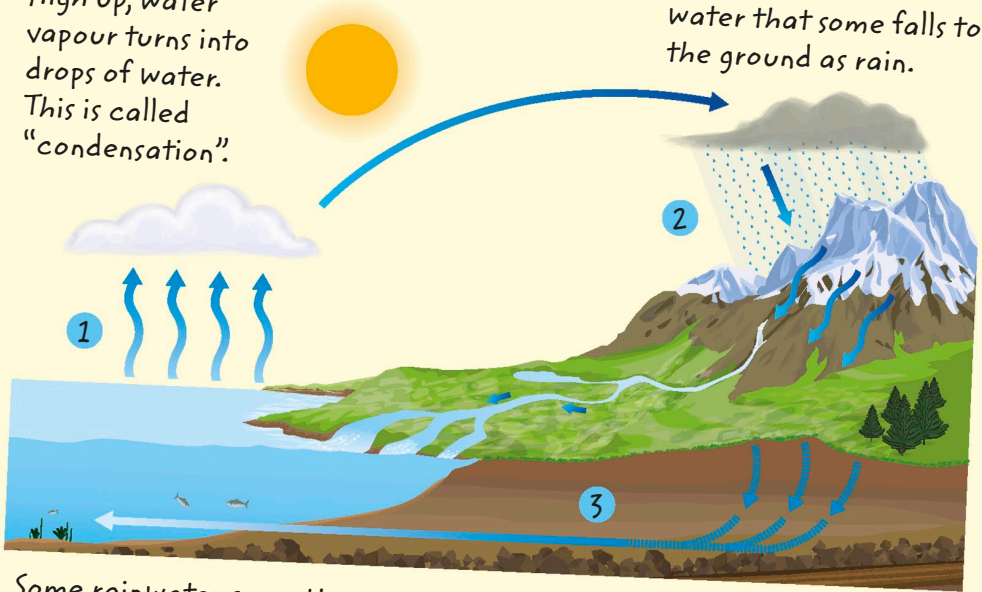
← Dew drops

THE WATER CYCLE

Rain is the same water going round and round in a never-ending circle called the water cycle.

High up, water vapour turns into drops of water. This is called "condensation".

Big clouds are so full of water that some falls to the ground as rain.



Some rainwater seeps through the ground before reaching rivers.

1. Damp air

Water gets into the air because the Sun heats up oceans and lakes. Millions of litres of water then rise into the air as invisible water vapour. This is called "evaporation".

2. Falling rain

When some clouds get big, the droplets of water in them bump into each other and grow. They get so big that they fall to the ground as rain. This is called "precipitation".

3. Running away

Some rain falls straight into the sea. Rain falling on the ground fills up rivers and streams, which run back to the sea, then the cycle begins all over again.

Rain and drizzle

Without clouds, it wouldn't rain. Rain is simply water falling from clouds of tiny water droplets. Clouds form because air currents carry air up until it cools, and the water vapour turns into drops of water, which fall as rain. When the raindrops are very fine, they fall as drizzle.

Record rainfall

The wettest place in the world is Mawsynram village in India, where up to 11,872 mm (467 in) of rain falls every year.



Raining ice

Sometimes rain falls as solid chunks of ice, called hailstones. These are made when raindrops are tossed high up in huge clouds, and freeze into ice. As they are bounced up and down inside the cloud, they grow into big hailstones.



See how the ice builds up in layers, like the layers of an onion.

Base of large grey
thundercloud, full of water



Rain approaching

This picture shows a heavy rainstorm over the Grand Canyon in the United States. Short, heavy showers like this are common in warm places, because the warmth can make air rise rapidly to create big rainclouds.

Weather clue

According to some country folk, you know rain is on its way when cows are all lying down in a field. Unfortunately, the cows sometimes get it wrong!



Raindrops

Every cloud holds millions of water droplets and ice crystals. They are so tiny that they are held up by air alone. Some big clouds have water droplets at the bottom and ice crystals at the top. Before rain falls, the droplets grow much bigger. Some grow by bumping into one another and joining together. Others grow by condensation.



See how they grow

In clouds forming high in the sky, water vapour freezes onto ice crystals, and they grow into snowflakes. Then they fall from the cloud. As they fall through warmer air, they melt into raindrops.

Tiny water droplets bump into each other and cling together as they fall.

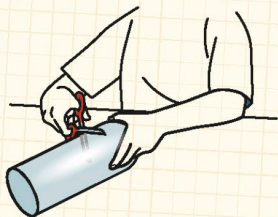
Drop by drop

As a raindrop falls, it gathers up smaller ones below, growing all the time. The biggest raindrops are about 5 mm (0.2 in) across. But drizzle measures less than 0.5 mm (0.02 in) across.

Raindrops send up a splash of water. However, drizzle does not make splashes on water.

MAKE A RAIN GAUGE

If you want to keep a record of how much rain falls, why not make yourself a simple rain gauge like this? You will need a large plastic soft drink bottle, scissors, sticky tape, a measuring jug, a heavy flower pot, a notepad, and a pencil.



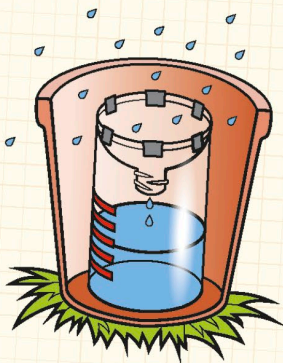
1. With an adult present, use a pair of good scissors to cut the neck off the bottle. Set the neck to one side, but don't throw it away!



2. Use the measuring jug to pour 100 ml (3.5 fl oz) of water into the bottle. Mark the level with some tape and then pour in more water, marking each 100 ml (3.5 fl oz) until it is full.



3. Empty the water out and attach the neck of the bottle upside down to the bottom with tape.



4. Set your gauge outside in a heavy flowerpot (to stop it blowing over). Then every day, or week if you prefer, make a note of how much water there is in the bottle, using the marks to help you.

Every time you measure the water, you can plot the result on a graph.

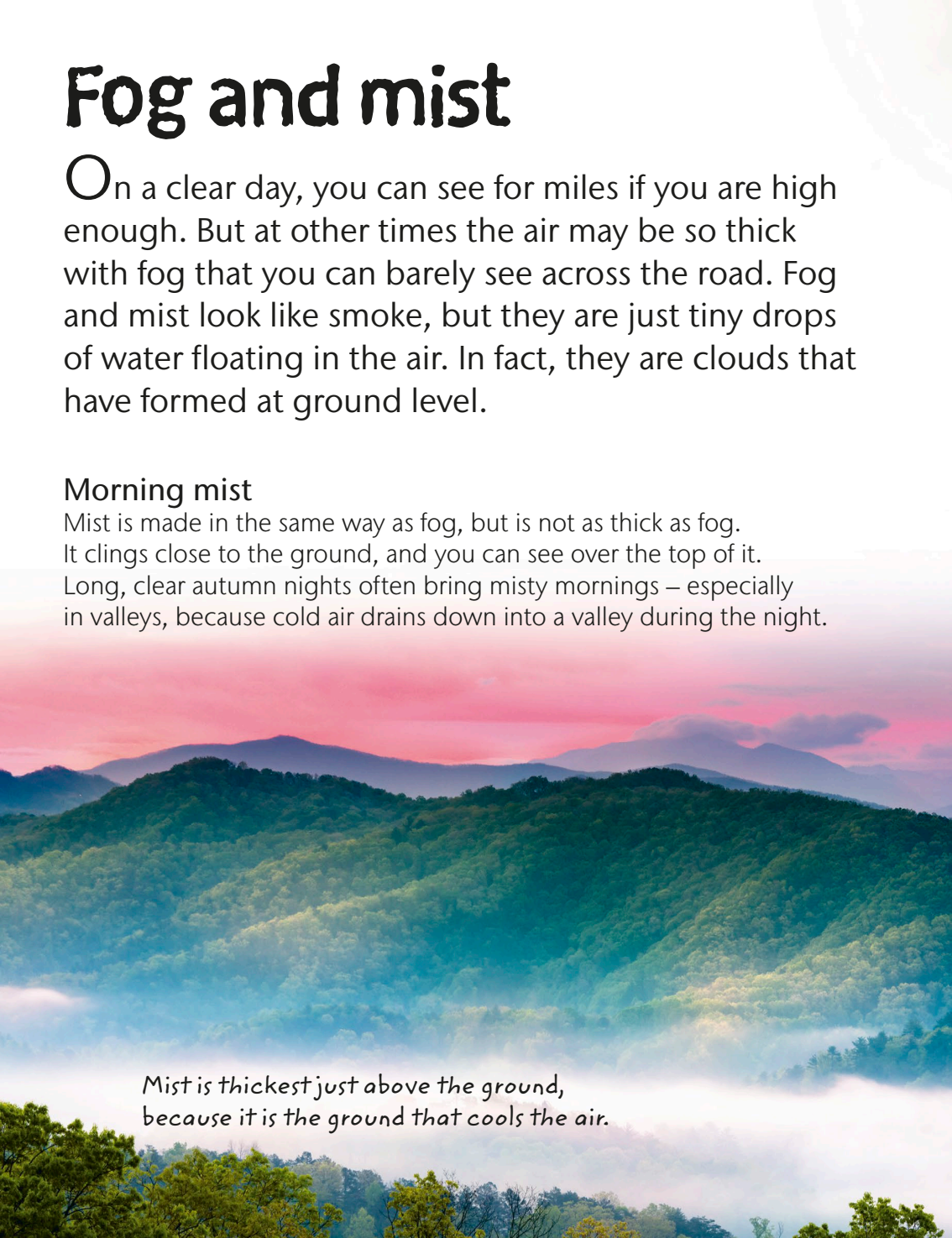


Fog and mist

On a clear day, you can see for miles if you are high enough. But at other times the air may be so thick with fog that you can barely see across the road. Fog and mist look like smoke, but they are just tiny drops of water floating in the air. In fact, they are clouds that have formed at ground level.

Morning mist

Mist is made in the same way as fog, but is not as thick as fog. It clings close to the ground, and you can see over the top of it. Long, clear autumn nights often bring misty mornings – especially in valleys, because cold air drains down into a valley during the night.



Mist is thickest just above the ground, because it is the ground that cools the air.

Golden mist

San Francisco's Golden Gate Bridge is often wrapped in mist because the warm California air is chilled by cold ocean currents.



Night fog

It gets foggy when the air is too cool to hold all its moisture, or water vapour. At night when the sky is clear, the ground gets cold. It cools the air close to it, making water droplets form in the air. The thickest fogs form when the air holds a lot of moisture.

Fog cuts visibility (the distance you can see) to less than 1,000 m (3,280 ft).

Souper fog

Dust and smoke make fog much worse. Before coal fires were banned in London in the 1950s, the city had some of the world's worst fogs, called "peasoupers" because they were so thick and yellow-green!



Frost and ice

In winter, the days are short and the Sun hangs low in the sky, so we barely feel its warming rays. On clear nights, there is no blanket of clouds to keep in even this warmth. In some countries, it gets so cold that moisture in the air freezes, covering the ground with sparkling frost.

Pretty cold!

If you live in a country where it gets very cold, you may see lovely patterns of fern frost on your windows. This is made when tiny water drops on the glass turn into ice. As more moisture freezes on top of these icy drops, feathery fingers of frost begin to grow.



When moisture in the air freezes, it becomes frost.

Frosty nights

On cold nights, plants may get so cold that moisture in the air freezes onto them instantly, instead of forming liquid dew. This is called hoar frost.



Rime frost only forms on one side.

Ice needles

If fog forms in very cold air, the tiny water droplets that make up the fog freeze onto anything they touch. The ice builds up in thick layers called rime. This is often swept into strange shapes by the wind.

Winter fun

It is lucky for us that ice floats on water. When it is really cold, ponds, lakes, and canals are covered with a layer of ice. If ice sank, not only lakes but all the sea would slowly turn into solid ice!



Ice is frozen water.



Never walk or skate on ice unless an adult has checked it is safe first!

Snowy weather



High up where the air is below freezing, clouds are made up of tiny ice crystals. These crystals grow into large snowflakes, which drift downwards and melt if the air gets warmer nearer the ground. However, if it is near or below freezing all the way down to the ground, we get snow instead.



White blanket

Once snow has covered the ground, it may not melt for a while, because the white snow reflects warming sunlight. If it melts and then refreezes, the crisp blanket will last even longer.

It snows the most when the temperature is at freezing point, which is 0°C (32°F).

Winter sports

Snowy weather can have its benefits! Skiing and tobogganing down a snow-covered slope are popular winter sports.



SNOW WONDER

Put some snowflakes on a coloured surface and look carefully at them under a magnifying glass. You will see that they all have a six-pointed shape. However, just as no two people are exactly the same, no two snowflakes are identical.

You'll have to work quickly before they melt!



Actual size of a snowflake.



Snowflakes look like delicate lace.



All sorts of snow

When it is below freezing, snow is powdery and “dry” and is useless for making snowballs! However, when the temperature is just about freezing, the snow is “wet” and easily crushed into heavy snowballs.

Igloos are dome-shaped houses built of solid blocks of snow.



“Wet” snow makes good snowballs.



From breeze to gale

Winds are simply the air around us moving. Sometimes the air moves so slowly that the wind is too weak to lift a feather. At other times, it moves so fast that trees and walls are blown down. Strong winds can be very dangerous. The Beaufort wind scale divides winds into 13 “forces”. On the Beaufort wind scale, 0 is calm and 12 is a hurricane.



Force 2: Light breeze

When a light breeze blows, the weather is usually clear. You can feel air on your face, hear leaves rustle, and see plumes of smoke gently drifting.



Force 5: Fresh breeze

During a fresh breeze, clouds often start to scud across the sky, and small trees sway. Crested waves form on lakes.



Force 7: Near gale

During a near gale, the sky may be dark and stormy. Large trees sway and it becomes hard work walking against the wind.



Force 9: Strong gale

When the wind blows at strong gale force, the sky may be covered in thick cloud. Large branches snap and chimneys and roof tiles can be blown off.

Wind power

Windmills were once used to grind corn. Now they are used to make electricity. Forests of windmills like these can make enough electricity to light a whole town.

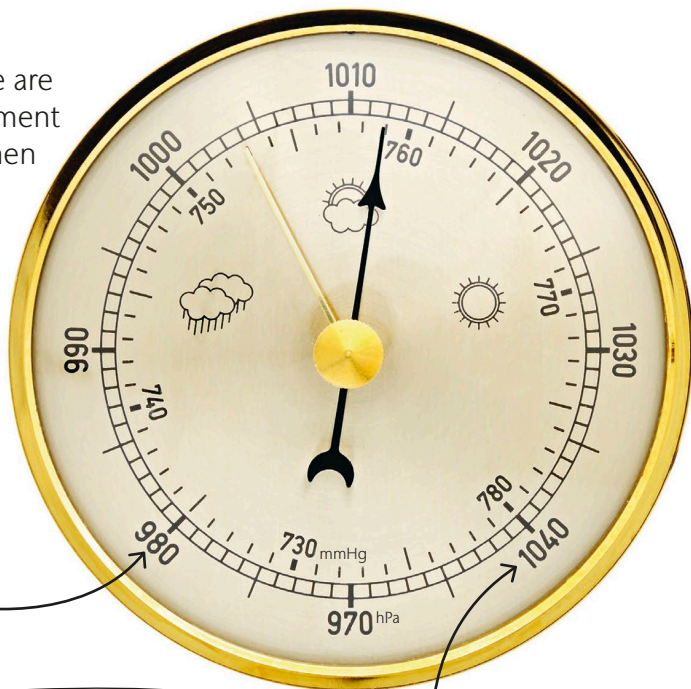


Under pressure

You can't feel it, but the air is pushing down on you all the time. This push is called air pressure. Sometimes pressure is high; sometimes it is low. Changes in air pressure bring changes in the weather and make winds blow.

Ups and downs

Changes in air pressure are measured on an instrument called a barometer. When pressure is low, the weather is often wet and cloudy. When it is high, the weather is usually dry and clear.



When the air pressure drops, stormy weather is on the way.

This barometer measures pressure in units called hectopascals (hPa), which are the equivalent of millibars (mb).

When air pressure stays high, the weather is likely to stay fine.

MAKE A BAROMETER

This barometer will help you predict the weather. Make it on a rainy day when the air pressure is low, or it will not work. You will need a jam jar or straight-sided glass, a long-necked bottle, water mixed with food colouring, and a marker.



1. Set the bottle upside down in the jar so that it rests on the rim. The top of the bottle should not quite touch the bottom of the jar.

2. Take the bottle out and pour enough coloured water into the jar so that it just covers the neck of the bottle when it is in place. On the jar, mark the level of the water in the bottle.



3. Set your barometer in a place where the temperature is fairly constant. Mark any changes in the water level over the next few weeks.



When the water is high in the bottle, pressure is high and it should stay fine.

When the water is low in the bottle, pressure is low and you can expect storms.

Right windy

Because the world is spinning, winds spin too – out of high and into low-pressure areas. Try standing with your back to the wind. If you live north of the equator, high pressure will be on your right. South of the equator, it will be on your left.



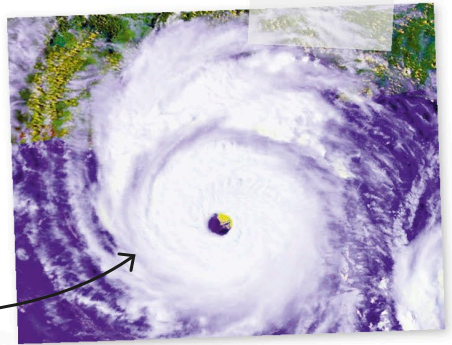
Superwinds

In summer, tropical places are hot and sunny. During autumn, the skies darken and storms sweep in from the sea, bringing fierce winds and lashing rain. These storms are called hurricanes, typhoons, or tropical cyclones, depending on where you live.

Tropical revolving storm

A hurricane starts when hot tropical sunshine stirs up moist air over the sea. It then whirls over the ocean in a giant spinning wheel of cloud, wind, and rain.

Picture of a hurricane taken from a satellite in space



Blown away

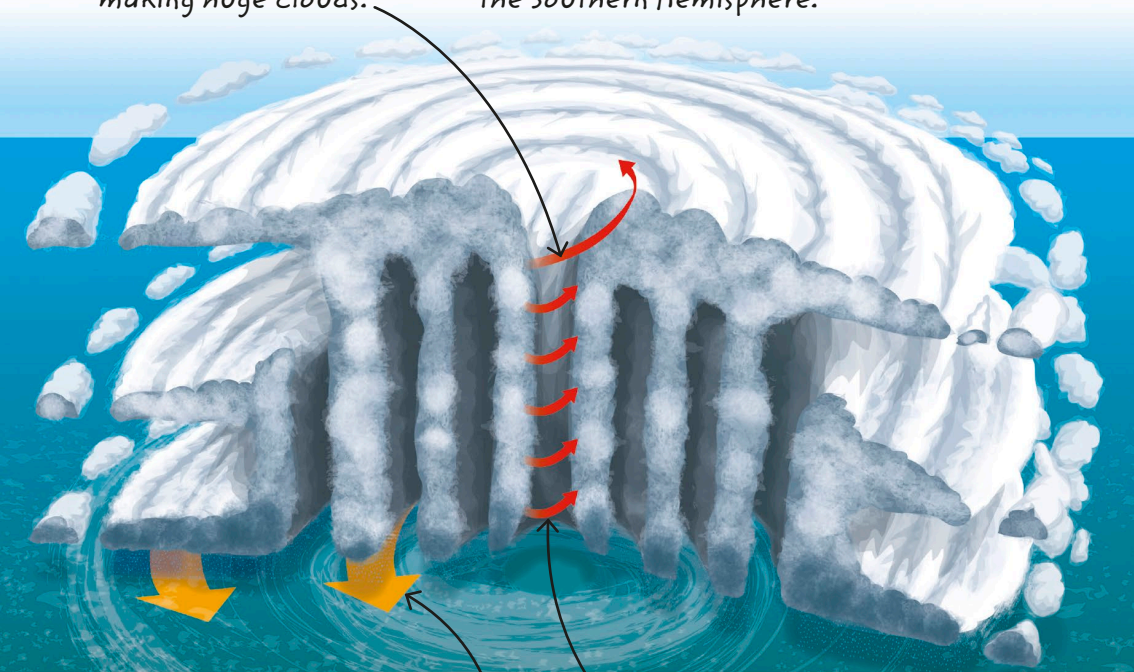
Howling hurricane winds can do terrible damage. On the coast, huge waves raised by the winds can swamp the shore.

Hurricane slice

What goes on inside a hurricane? Fierce winds hurtle around the bottom of the storm, but the centre is dead calm. The air that spirals up around the centre builds up tall rain clouds.

Warm, damp air spirals up around the centre of the storm, making huge clouds.

Hurricanes may be 1,500 km (932 miles) across and 12 km (7 miles) or more high. Hurricane winds in the Northern Hemisphere spin in the opposite direction to the hurricane winds in the Southern Hemisphere.



Hurricane winds blow around the base of the storm at 300 kph (186 mph) or more.

The air in the very centre, or "eye", of the storm is clear and calm.

Every hurricane is given a name. Once, only girls' names such as Jane and Diana were used, but now they use boys' names too.

Twisters

Twisters, or tornadoes, are whirling funnels of air. They hang down from thunderstorm clouds, which form in very hot and humid weather. Twisters usually last about 15 minutes, but if the bottom of a funnel touches the ground, it will smash everything in its path instantly.



Twister alert

If you see thunderclouds with small, rounded “lumps” beneath them, they are a good sign that a tornado is on the way. These bulging clouds are called mammatus clouds.

Twisters are like the funnel that forms when water is sucked down a plughole.

White column

Inside a tornado, air is sucked upwards and starts to spin at enormous speed. An approaching tornado is white, because it has not yet touched the ground and picked up dust and debris.



Waterspout
When a tornado develops over calm seas, it is called a waterspout. Mist, spray, and water are sucked up into the twisting funnel.

Tornadoes are most common in the United States.

On target

A tornado makes a deafening roar as it passes by. As the bottom of a tornado touches the ground, it sucks dust and debris high into the sky. It can also lift heavy objects before hurling them back to the ground.



At the centre of a tornado, wind speeds can reach 400 kph (250 mph). They are the fastest winds on Earth.

Hot weather

In places where the Sun sits high in the sky at midday, the days are long and the weather is hot. Hot weather often comes with high pressure areas, because they bring clear skies and light winds. High pressure can last for a long time, making hot, sunny weather last for days on end.

Thermometer

Thermometers help us to measure the temperature. Sealed inside a glass tube is some dyed alcohol. The liquid expands as the temperature rises and shrinks as it gets colder.

Glass tube holding alcohol dyed blue.



Mirage

Sometimes, on a very hot day, you may see a mirage – a pool of water on the road ahead. Then, as you approach, it disappears. What you are actually seeing is the reflection of the sky on a layer of hot air just above the ground.

THE POWER OF THE SUN

The Sun gives off energy, which we feel as heat. Its energy can be trapped by solar panels and made into electricity.



If the day starts sunny with few clouds, the temperature soon starts to rise.

The Sun is high in the sky.



Short trails of condensation are left by the aircraft.



"Heat-haze" is made when dust and pollution are trapped near ground level.



A hot, dry day

On a hot day, if the air is dry and calm, there are no clouds in the sky. Hot, humid weather is more unpleasant, because water vapour in the air makes us feel sticky and uncomfortable.

Dry weather

Some countries have plenty of water and shortages are rare. However, in some parts of the world water is scarce, and people can never be sure when it will rain next. Droughts happen when for months – or even years – on end, the Earth's surface loses more water than it collects. In some places, called deserts, rain hardly ever falls at all.

Drought

If droughts last for a very long time, animals die of thirst, crops wither in the hot Sun, and people have to go without food – they may even die of starvation.

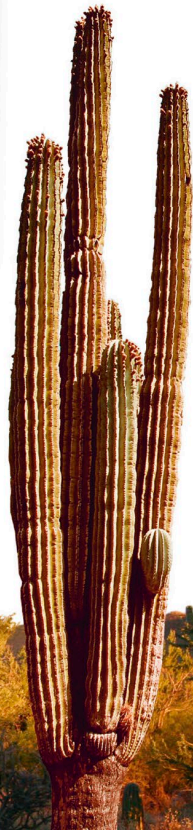


*Parched,
cracked land*

Desert scene

You'll often find deserts inland, next to mountain ranges. The mountains act as a shield and keep rain-bearing clouds away. Semi-deserts like this one in Arizona, in the United States, have a little rainfall – enough to support plants that can store water, like cacti.

*In true deserts,
plants and
animals can only
live near oases,
which are areas
of open water.*





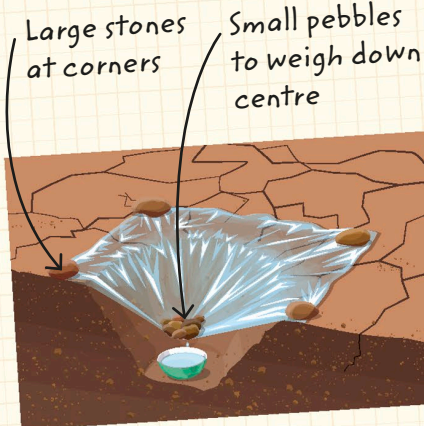
Death Valley

One of the driest and hottest places in the world is Death Valley, in the United States. People have died of thirst here in the extreme heat.

Not all deserts are hot.
Central Antarctica is one of
the driest places on Earth.

Dust Bowl

Drought can affect many people's lives. In the 1930s, The Great Plains of North America suffered from a disastrous drought that created a "dust bowl". Terrible dust storms buried crops and houses, and many people were forced to leave their homes.

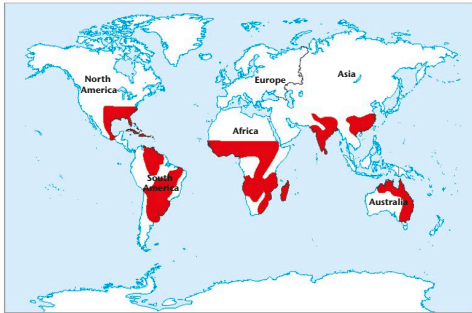


MAKE A GARDEN MOISTURE TRAP

Dig a hole and put a bowl in the centre. Cover it with plastic, held down by stones. The next day, you'll see water in the bowl. This happens because water evaporates from the soil and condenses on the plastic, running off into the bowl.

Monsoon

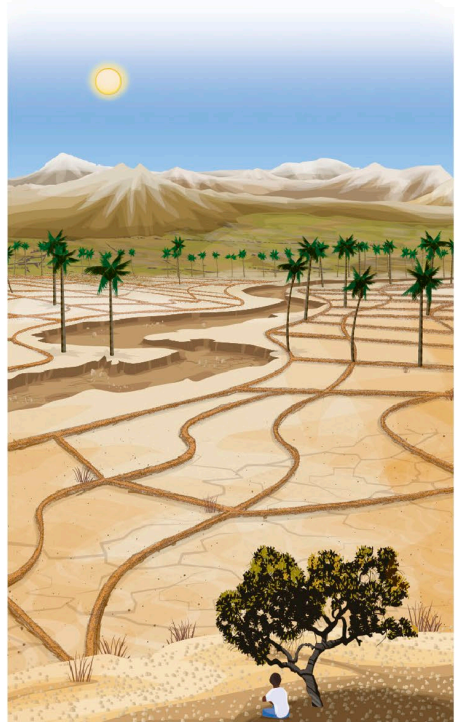
A monsoon is a seasonal wind that blows for about six months in one direction, then turns around and blows in the other direction for six months. In summer, moist winds from the ocean bring dark, rain-bearing clouds to the land. In winter, the cycle is reversed. Wind blows the air from the land to the sea, bringing cool, dry weather.



The monsoon areas are coloured red.

Where the wind blows

The monsoon is best known in Asia, but monsoon winds also bring rain to other places in the tropics including Africa, South America, the southern United States, and Australia.



Before the monsoon

During the early summer, the hot Sun heats up the dry tropical land, while the seas and oceans stay cooler. As warm air rises above the land, cool, moist air from the sea rushes in to fill its place. The winds blowing the sea air bring heavy rainfall.

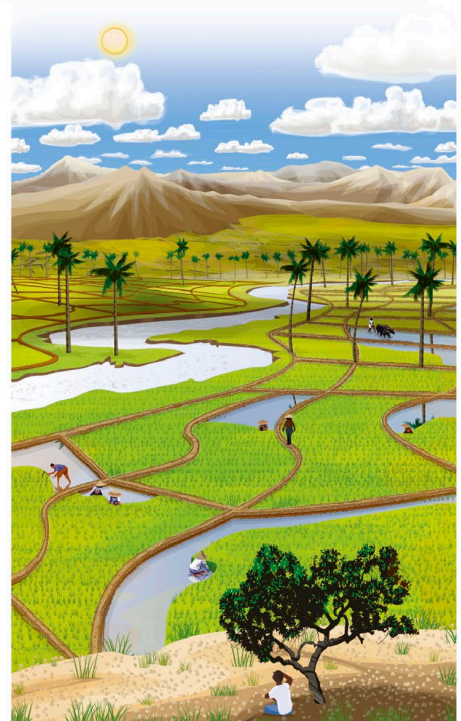
Life goes on

The rain is often so heavy that it washes away crops and floods the streets. Violent thunderstorms can also occur, but whatever the monsoon brings, life goes on.



Monsoon in action

Monsoons are vital for growing crops. Once the monsoon begins, the wet conditions are ideal for rice farmers, who can start planting young rice plants in the flooded fields.



After the rain

For six months, showers sweep across the land. Finally, the wind and rain die down. The cool air flows back towards the sea and the land begins to dry.

A warm front

If weather forecasters say a “front” is on the way, then expect the weather to become wet and windy. A warm front is where a mass of warm moist air is pushed up over a mass of colder, drier air creating clouds and rain. Fronts move along with areas of low pressure, and the winds blow stronger as they pass by.



Wispy warning

When you see wisps of feathery cirrus clouds in the sky, you can be sure a warm front is on the way.



Clouding over

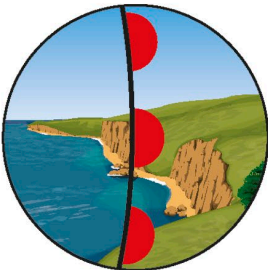
After a while, the sky gets hazy and the clouds thicken. Fluffy altocumulus clouds appear, looking like streaks of cotton wool. The wind grows stronger, making the sea very choppy.

Nimbostratus clouds



Wet and windy

Soon the sky is dark with thick nimbostratus clouds. It begins to rain steadily and goes on raining for several hours. If it is cold enough, it may even snow.

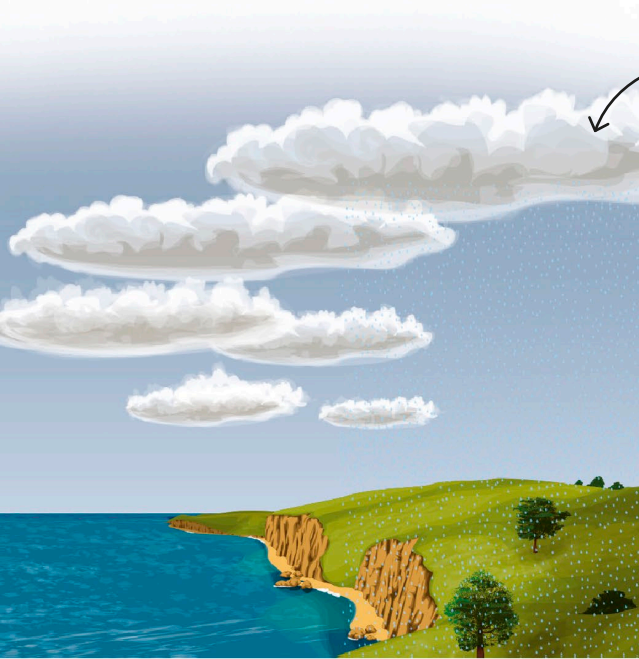


Red line

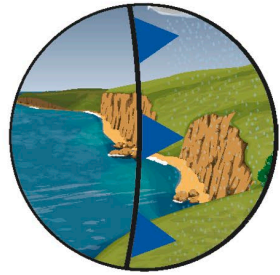
On weather maps, a warm front is a line with red bumps on it. The bumps point the same way as the wind blows.

A cold front

Fronts usually come in pairs. Often there is only a brief gap between one front passing and the next arriving. The first is a “warm” front because it brings warmer air. The second is a “cold” front, and brings colder air and sometimes even stormier weather than the warm front.



Stratocumulus clouds bring occasional drizzle.



On the move

On a weather map, a cold front is a line with blue spikes. The spikes show which way the cold air is moving.

Brief relief

As the warm front moves away, the rain (or snow) stops and it gets warmer. Near the coast it stays cloudy, and there may be drizzling rain.

In summer, inland, the Sun comes out and it can get hot after the warm front has moved away.



Storm overhead

You know the cold front is on its way when the wind becomes stronger, giving gusts that rattle windows. The sky may fill with huge dark thunderclouds that lash the countryside with rain or even hailstones.

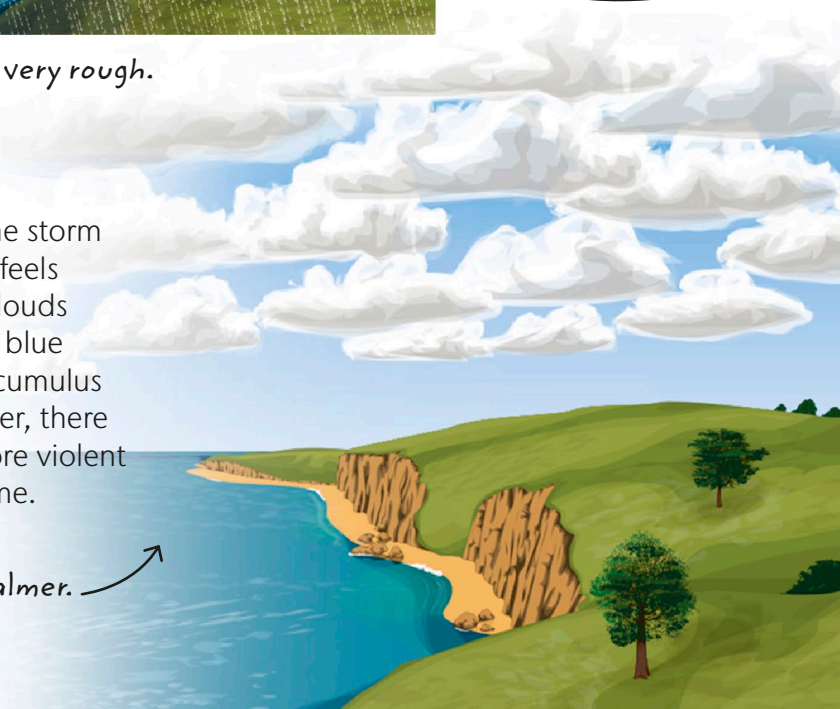
More rain may fall in the few minutes a cold front passes than all the hours of a warm front!

The sea is very rough.

It's all over

The worst of the storm is soon over. It feels colder as the clouds clear, leaving a blue sky with fluffy cumulus clouds. However, there may still be more violent showers to come.

The sea is calmer.

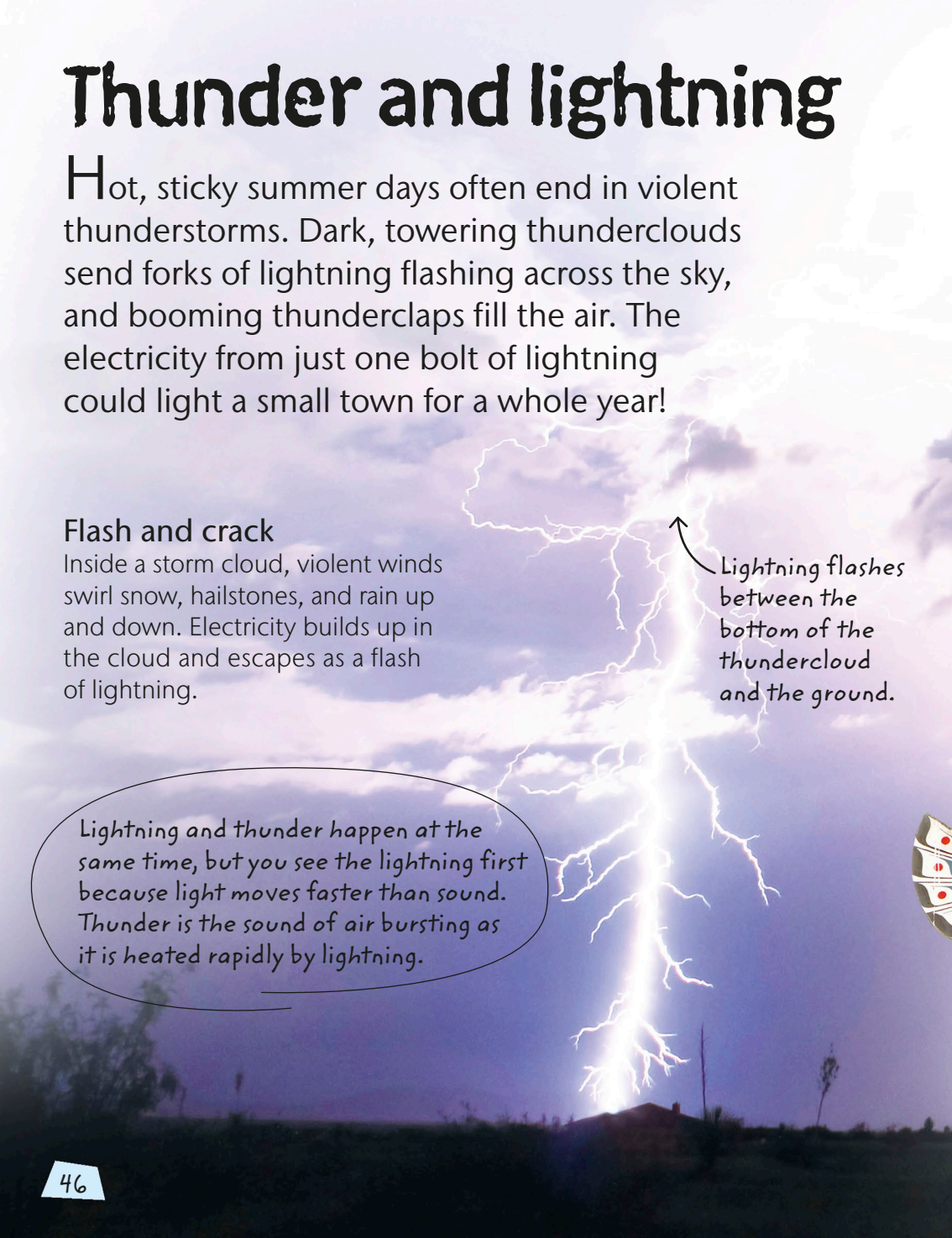


Thunder and lightning

Hot, sticky summer days often end in violent thunderstorms. Dark, towering thunderclouds send forks of lightning flashing across the sky, and booming thunderclaps fill the air. The electricity from just one bolt of lightning could light a small town for a whole year!

Flash and crack

Inside a storm cloud, violent winds swirl snow, hailstones, and rain up and down. Electricity builds up in the cloud and escapes as a flash of lightning.



Lightning flashes between the bottom of the thundercloud and the ground.

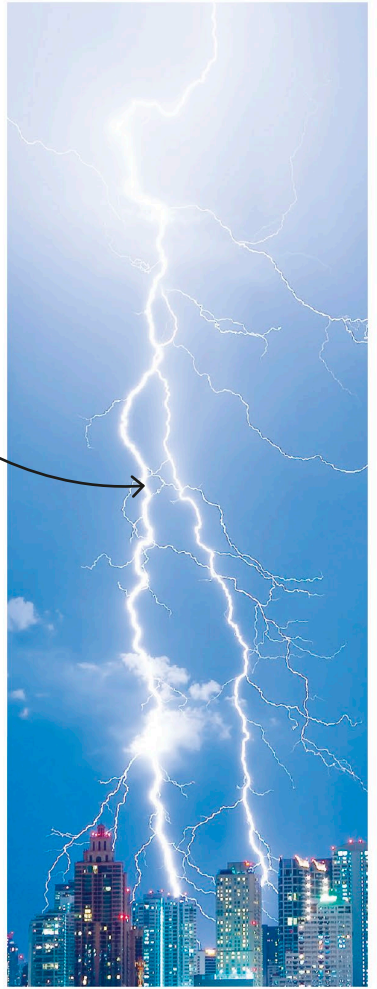
Lightning and thunder happen at the same time, but you see the lightning first because light moves faster than sound. Thunder is the sound of air bursting as it is heated rapidly by lightning.

Strike

Lightning always takes the quickest path to the ground. So tall trees and buildings are most likely to be struck. The world's tallest buildings are struck by lightning hundreds of times each year.

Each fork of lightning is many lightning flashes running rapidly up and down the same path.

You can work out how far away a storm is by counting the seconds between a flash of lightning and a thunderclap. For every three seconds you count, the storm is 1 km (0.6 miles) away.



Holy thunder

Some Native Americans believed that the sacred thunderbird made thunder by beating its enormous wings, and that lightning flashed from its beak.

Colours in the sky

The sky isn't always blue, even when it's fine. Near sunset it can be purple or even red. This is because sunlight is made up of the seven colours of the rainbow, all jumbled up together. As sunlight bounces in different ways off dust and other particles in the air, different colours appear.



Rainbow Snake

Australian Aboriginals worship a spirit known as the Rainbow Snake. He lives in water and is the great creator who has made the features of the Earth. He can appear as a rainbow.

Rainbows are curved because of the way light hits the round raindrops.



Curving colours

When sunlight passes through raindrops in the air, the light splits into seven colours – red, orange, yellow, green, blue, indigo, and violet. Many raindrops help to create the pattern.

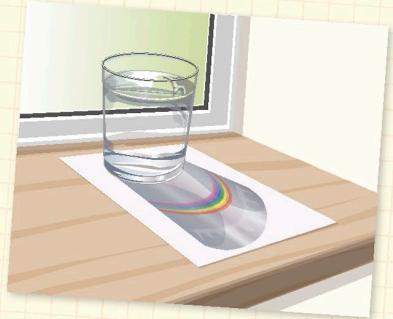


Ring around the Sun

When the Sun shines through thin icy cloud, a coloured halo may appear. This is caused by ice crystals in the cloud splitting sunlight into the seven colours, just as raindrops do. Never look directly at the Sun, as it will damage your eyes!

MAKE A RAINBOW

You can make your own rainbow with just a glass of water and bright sunlight. Stand the glass on white paper, facing the Sun. The sunlight will shine through the glass and split into the seven colours.



You always see the colours in a rainbow in the same order, from red through to violet.

Sometimes there is a second, outer bow, and its colours are always the other way round.

To see a rainbow, the Sun must always be behind you.

Changing weather

The world's weather has changed many times. About 10,000 years ago, great sheets of ice covered a third of the Earth. That was the last Ice Age. Today we live in a much warmer climate. Many scientists think we have harmed the atmosphere so much that the world is getting even warmer.

Prehistoric weather

Millions of years ago, when dinosaurs roamed the land, much of Europe and North America was covered in forests. The climate was hotter and more humid than it is today.

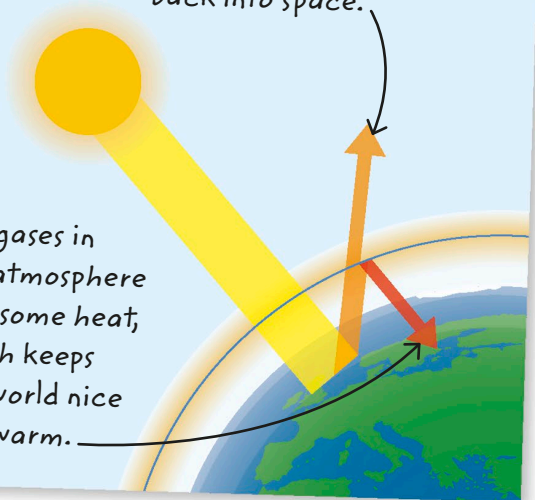


Sun trap

Only a small portion of the Sun's heat reaches the Earth. But the Earth stays warm because gases, such as carbon dioxide, trap the heat – just like the glass in a greenhouse. Carbon dioxide is a greenhouse gas that is made when we burn wood, coal, or oil. If we produce too much, the Earth may get too warm.

The gases in the atmosphere trap some heat, which keeps the world nice and warm.

Some heat is reflected back into space.



A big umbrella

When volcanoes erupt, they throw large amounts of dust and smoke high into the atmosphere. This cuts off sunlight, shading the ground like a big umbrella. This can make temperatures drop all over the world for a year or more.



Save the trees

Trees take in carbon dioxide and release oxygen and moisture, which is turned to rain. Cutting down the trees stops them doing this, and burning them releases all the carbon dioxide they soaked up as they grew, helping to raise the Earth's temperature.

Tropical rainforests are vital in removing excess carbon dioxide from the air. But in the Amazon region, an area of rainforest the size of Britain is cut down every year for farming.



Pollution

You may find it hard to believe, but many things people do every day create pollution. Too much pollution can cause changes in the weather. It may get too hot in some places, and cause floods or drought in others. Cutting down on pollution now means a cleaner world tomorrow!

Pollution problems

Smoke and gases from factories pollute the air and may form smog. This is a mixture of smoke and fog, which can make people sick. Car exhausts may give off poisonous gases that not only affect our lungs but can block out the sunlight.

Acid rain

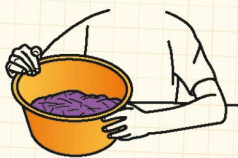
Power stations that burn coal or oil to generate electricity release waste gases into the air. The gases drift on the wind until raindrops dissolve them, making “acid rain”. This eats away at buildings and kills trees, plants, and life in rivers and lakes.

Acid rain, carried by wind, can destroy pine forests thousands of kilometres away.



TEST FOR ACID RAIN

Here is an experiment you can try to test for acid in rainwater. You will need two finely chopped red cabbage leaves, distilled water (from a pharmacist), rainwater, a bowl, two glass jars, a measuring jug, and a sieve.



1. Put the leaves into the bowl. Get an adult to pour hot distilled water over them. Then let them stand for an hour.



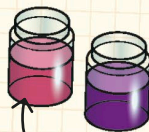
2. Strain the cabbage juice into a measuring jug. The liquid should be a dark purple colour.



3. Pour 20 ml (0.7 fl oz) of distilled water into one jar, and 20 ml (0.7 fl oz) of rainwater, collected from your garden, into the other.

4. Add the same amount of cabbage juice to each jar. The water will change colour. Compare the colour of the distilled water (this stays the same) and the rainwater. If the rainwater turns red, it is acidic.

Rainwater

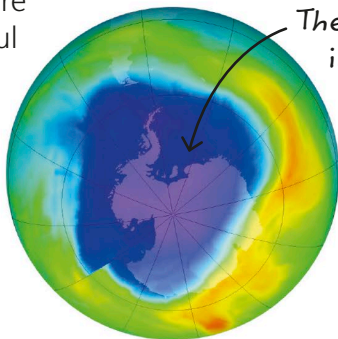


Distilled water

The stronger the acid, the redder the water gets.

The Earth's blanket

The ozone layer of our atmosphere protects us from the Sun's harmful ultraviolet rays. However, some chemicals can destroy it. As a result, holes have appeared in the ozone layer, allowing more of the harmful rays to reach the Earth's surface and damage many living things.



The blue areas in this satellite photograph show the hole in the ozone layer over the Antarctic.

Weather lore

Nowadays, weather forecasters use satellites and radar to tell us what the weather holds. Before this, people used to look for clues in nature to predict the weather. They didn't just look at the skies – they also watched how animals and plants acted. Some of the signs are reliable, but others aren't foolproof!



Groundhog forecast

In the United States, people say that if you can see a groundhog's shadow at noon on the second of February, there will be six more weeks of winter. Fortunately, the groundhog isn't always right!



Red sky at night

People used to say a red sunrise meant bad weather to come, and that a red sunset meant good weather to come. Try to watch the sky at sunrise and sunset to see if this saying is always correct.





The pine cone's scales open in dry weather.



Scales are tightly shut in wet weather.

OPEN AND CLOSE

Pine cones are traditionally used to forecast the weather. Put a pine cone outdoors and watch what happens. It will open out in very dry weather and close up when it is damp.

Flower power

When you want to know what the weather will be like, look for the magic carpet flower. It grows in the wild in South Africa and is a popular garden plant elsewhere. The petals stay wide open in fine weather, but they close up when the sky grows dark.



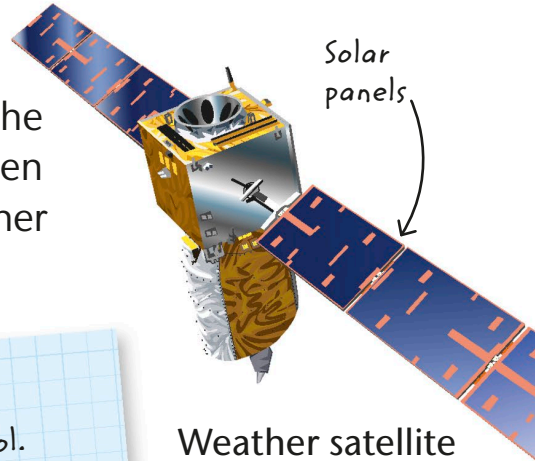
Frog-cast

One way to tell if it's going to rain soon is to look out for frogs. They love to come out when it's damp. As the air usually becomes humid before it rains, you may see more frogs about and you will know to expect rain.



Weather forecasting

To work out what weather is on its way, forecasters take measurements from weather stations all over the world. They also study information gathered by satellites in space. The information is entered into powerful computers that work out how it might affect the atmosphere. The results are then used to forecast how the weather is going to change.



WEATHER SYMBOLS

Every type of weather has a special symbol. Try keeping track of the weather for a week and see how many different symbols you use.



Sunny



Sunny intervals



Cloudy



Light rain



Heavy rain



Thundery showers



Hail showers



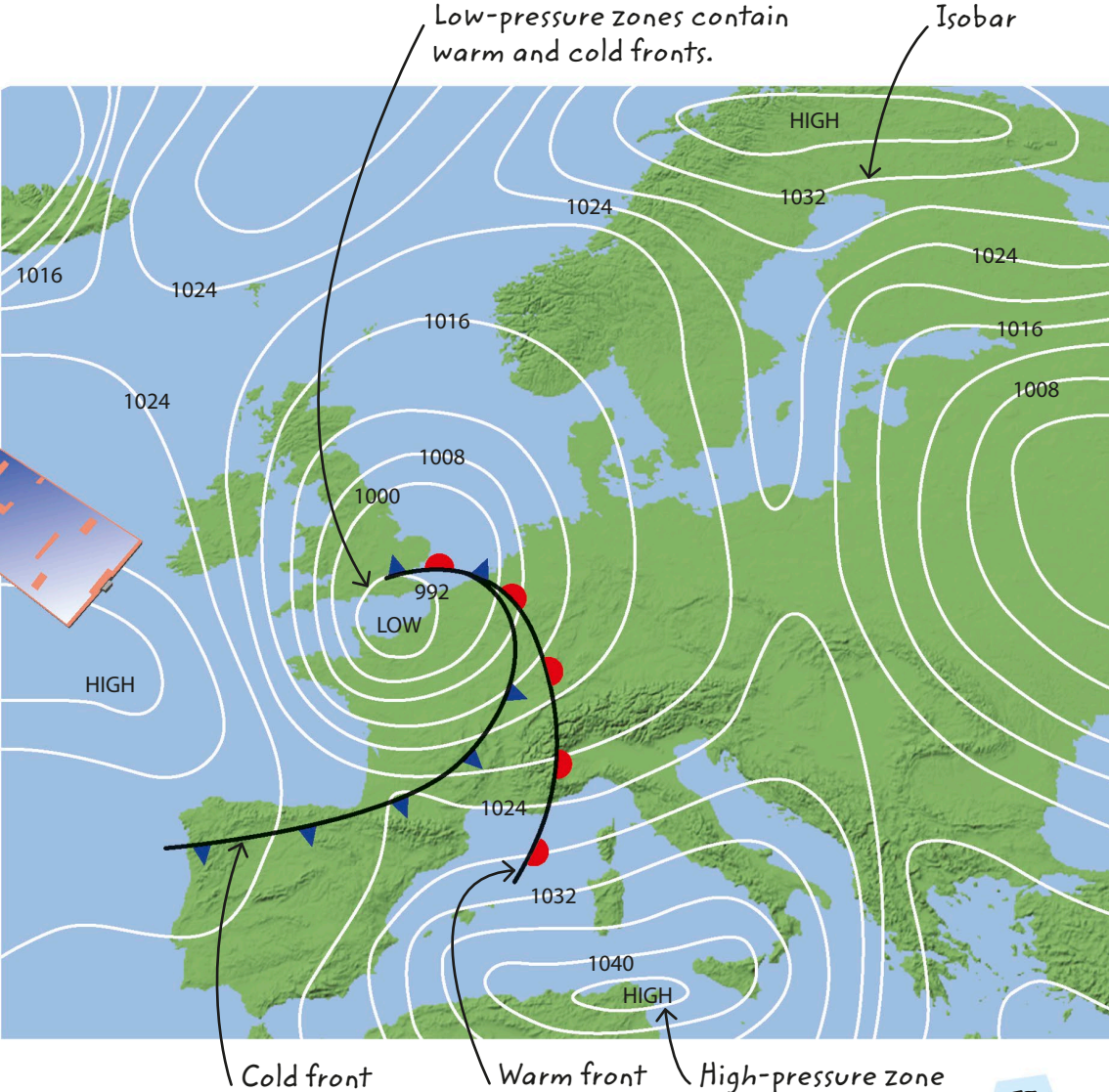
Heavy snow

Weather satellite

Satellites in space are controlled by teams of people on Earth, but they can carry out many tasks automatically.

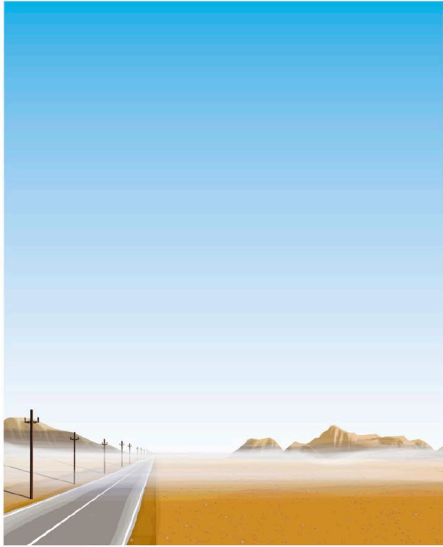
Weather map

Information about the weather is often shown on maps. Places where the atmospheric pressure is the same are joined by lines called isobars. The isobars form rings around zones of low pressure and high pressure.



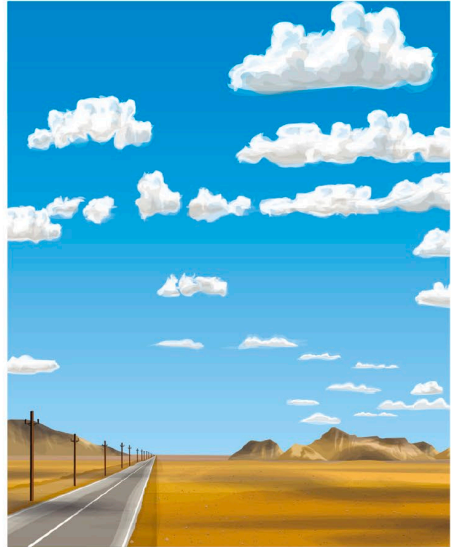
The day

During the course of each day there are changes in the weather. On fine days, you can almost tell the time by the way the weather changes through the day – from the cool chill of dawn through the heat of the afternoon to the clear, calm evening.



Sun rise

Dawn is usually chilly, as the ground loses heat steadily all night. It is often misty too, for the cool of the night makes water condense in the air.



Midday

As the Sun climbs in the sky, morning mists fade away and it gets warmer. By midday, a few fluffy cumulus clouds appear, made by rising warm, moist air.

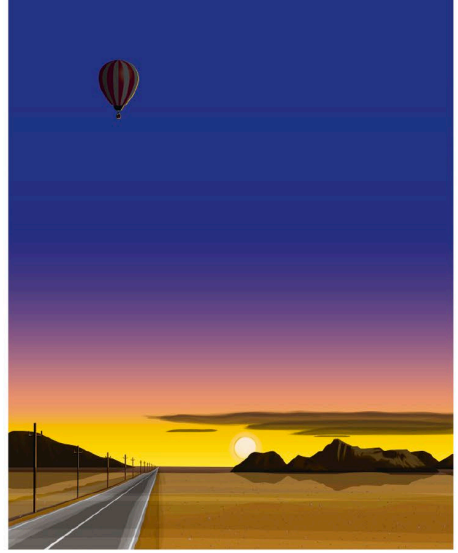


Mid-afternoon

Mid-afternoon is the warmest time of the day. Often, though, the morning's fluffy cumulus clouds can build up and up until they interrupt the afternoon with brief but heavy showers of rain, or even thunderstorms.

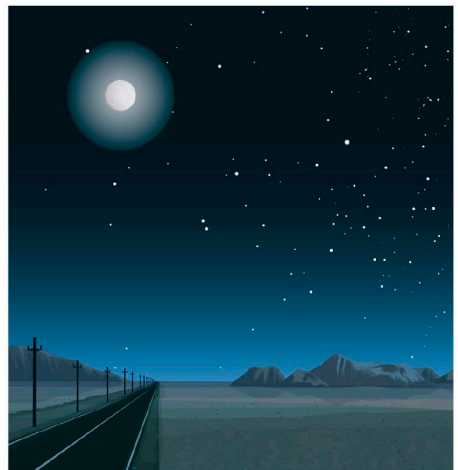
Night

Once the Sun has dropped below the horizon it gets steadily colder – especially if there are no clouds to keep the heat in.



Towards sunset

As the Sun drops lower towards sunset, its power to stir up the air gets less and less. So the end of the day is often calm and clear, with barely a cloud in the sky.



Index

A

acid rain 52–53
air 8–9
air pressure 30–31,
57
altocumulus clouds
15, 42
altostratus clouds 14
atmosphere 9, 50–51
autumn 11

B

barometers 30–31
Beaufort wind scale
28–29
breezes 28

C

carbon dioxide 50, 51
cirrocumulus clouds
15
cirrostratus clouds 14
cirrus clouds 12, 42
climate 8
climate change 50–51
clouds 12–15, 34, 42, 43,
44, 45, 58–59
cold fronts 44–45,
57
colours, rainbow
48–49
condensation 17, 20,
58

cumulonimbus clouds
15
cumulus clouds 13, 15,
45, 58, 59

DE

deserts 8, 38–39
dew 16, 24
drizzle 18, 20
drought 38–39,
52
dry weather 38–39
dust bowl 39

exosphere 9

F

floods 41, 52
fog 22–23, 25, 52
fog and mist 22–23
forecasts 9, 54–55,
56–57
frogs 55
fronts 42–43, 44–45,
57
frost 24–25

GH

gales 29
greenhouse gases 50
groundhogs 54

hailstones 18, 45, 46
heat-haze 37
high pressure 30, 31,
36, 57

hoar frost 24
hot weather 36–37,
38–39
humidity 16, 37,
55
hurricanes 9, 32–33

IL

ice 24–25
Ice Age 50
isobars 57

lightning 46–47
low pressure 30, 31,
57

MN

mackerel sky 15
magic carpet flower
55
mammatus clouds 34
mare's tails 12
mesosphere 9
mirages 36
mist 22–23
moisture trap 39
monsoon 40–41

nimbostratus clouds
14, 43

OP

ozone layer 9, 53
pine cones 55
pollution 52–53

R

rain 17, 18–19, 20–21, 56
rain gauge 21
raindrops 20
rainbows 48–49
rainforests 51
rime frost 25

S

satellites 9, 56
seasons 10–11
showers 19, 45, 56, 59
smog 52
snow 20, 26–27, 46
solar power 36
spring 10
storms 45, 46
stratocumulus clouds 15, 44
stratosphere 9
stratus clouds 13, 14
summer 11
Sun 10–11, 14, 17, 24, 36–37, 38, 40, 44, 50, 52, 58–59
sunset 48, 54, 59

TV

temperature 36, 50–51
thermometers 36
thermosphere 9
thunderstorms 15, 34,

45, 46–47, 59
tornadoes 15, 34–35
tropical cyclones 32
troposphere 9
twisters 34–35
typhoons 32

volcanoes 51

W

warm fronts 42–43, 44, 57
water 8
water cycle 17
water vapour 16–17, 18, 20, 23, 37
waterspouts 35
weather maps 43, 44, 57
wind 9, 28–29
wind power 29
winter 10, 11, 24–25, 26–27

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