PAPER WORLD

PLANET EARTH

Take a look inside Planet Earth – with 30 flaps to lift!

illustrated by BOMBOLAND

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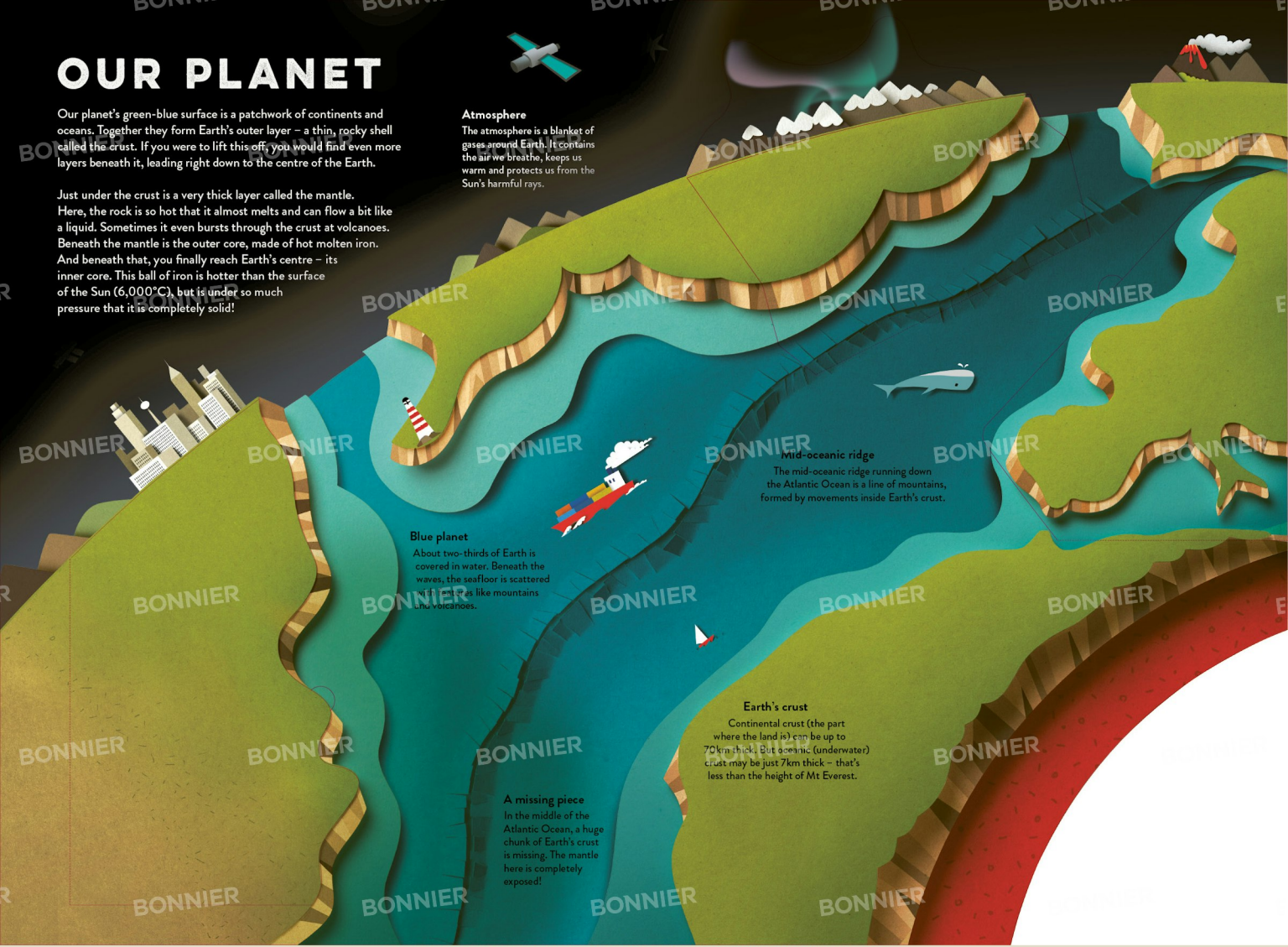
Our planet Earth is a giant globe travelling through space at hundreds of kilometres per second. It is covered in dense green jungles, baking hot deserts and deep, wide oceans. But under its surface it has many more secrets to reveal to us – from bright gems glittering inside rocks, to vast cave systems, and hot pockets of bubbling magma.

Turn the pages of this book and lift the hidden flaps to explore Earth's secrets and reveal layer after layer of incredible facts.

OUR PLANET

Our planet's green-blue surface is a patchwork of continents and oceans. Together they form Earth's outer layer – a thin, rocky shell called the crust. If you were to lift this off, you would find even more layers beneath it, leading right down to the centre of the Earth.

Just under the crust is a very thick layer called the mantle. Here, the rock is so hot that it almost melts and can flow a bit like a liquid. Sometimes it even bursts through the crust at volcanoes. Beneath the mantle is the outer core, made of hot molten iron. And beneath that, you finally reach Earth's centre – its inner core. This ball of iron is hotter than the surface of the Sun (6,000°C), but is under so much pressure that it is completely solid!



Atmosphere
The atmosphere is a blanket of gases around Earth. It contains the air we breathe, keeps us warm and protects us from the Sun's harmful rays.

Blue planet
About two-thirds of Earth is covered in water. Beneath the waves, the seafloor is scattered with features like mountains and volcanoes.

Mid-oceanic ridge
The mid-oceanic ridge running down the Atlantic Ocean is a line of mountains, formed by movements inside Earth's crust.

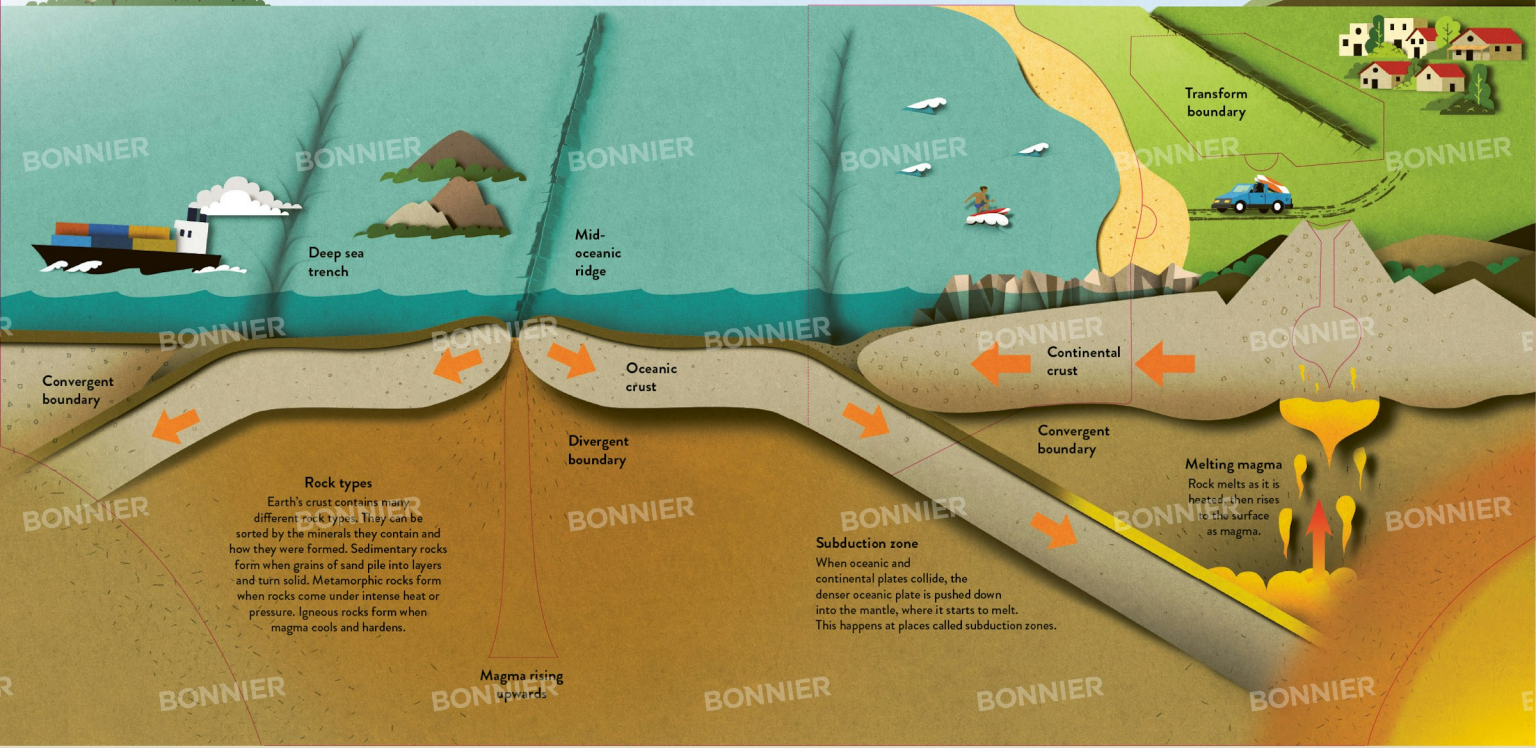
Earth's crust
Continental crust (the part where the land is) can be up to 70km thick. But oceanic (underwater) crust may be just 7km thick – that's less than the height of Mt Everest.

A missing piece
In the middle of the Atlantic Ocean, a huge chunk of Earth's crust is missing. The mantle here is completely exposed!

TECTONIC PLATES

Earth's outer layer is split into big slabs called tectonic plates, like the pieces of a jigsaw puzzle. They are constantly moving – very, very slowly – passing by or bumping into each other at places called boundaries.

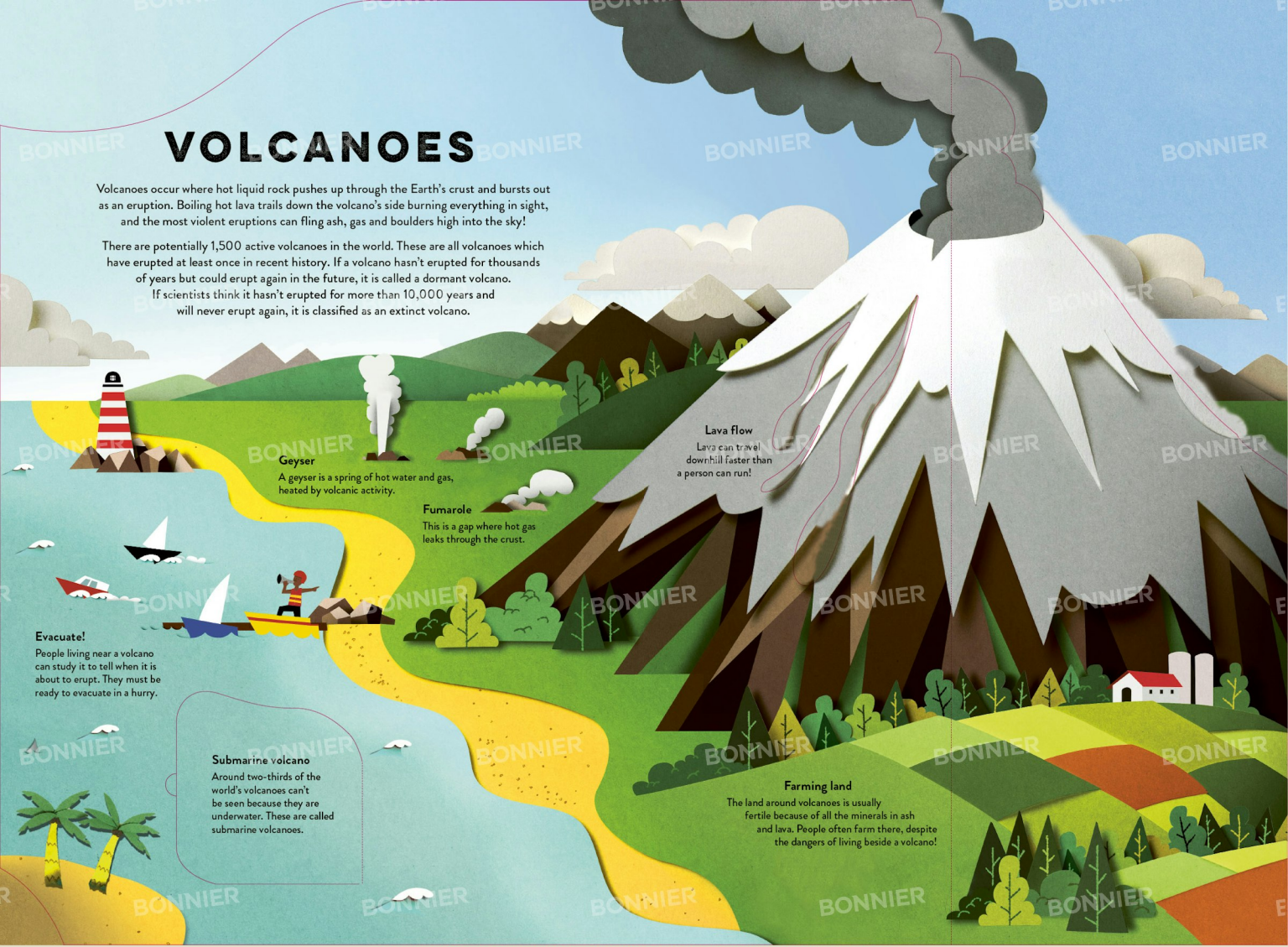
There are three main types of plate boundary. Divergent boundaries occur where plates move away from each other: they create wide stretches known as mid-oceanic ridges underwater, or as rift valleys on land. Convergent boundaries are where plates move towards each other: they make mountain ranges as the plates buckle together, or form deep sea trenches underwater. Transform boundaries are where plates slide past each other. These passing plates sometimes 'snag' and trigger huge earthquakes!



VOLCANOES

Volcanoes occur where hot liquid rock pushes up through the Earth's crust and bursts out as an eruption. Boiling hot lava trails down the volcano's side burning everything in sight, and the most violent eruptions can fling ash, gas and boulders high into the sky!

There are potentially 1,500 active volcanoes in the world. These are all volcanoes which have erupted at least once in recent history. If a volcano hasn't erupted for thousands of years but could erupt again in the future, it is called a dormant volcano. If scientists think it hasn't erupted for more than 10,000 years and will never erupt again, it is classified as an extinct volcano.



Geyser
A geyser is a spring of hot water and gas, heated by volcanic activity.

Fumarole
This is a gap where hot gas leaks through the crust.

Lava flow
Lava can travel downhill faster than a person can run!

Evacuate!
People living near a volcano can study it to tell when it is about to erupt. They must be ready to evacuate in a hurry.

Submarine volcano
Around two-thirds of the world's volcanoes can't be seen because they are underwater. These are called submarine volcanoes.

Farming land
The land around volcanoes is usually fertile because of all the minerals in ash and lava. People often farm there, despite the dangers of living beside a volcano!

MOUNTAINS

Mountains are huge rocky features, towering high over the surface of the Earth. Most formed over millions of years as tectonic movements crumpled rocks in the Earth's crust. Their jagged peaks and steep slopes were then slowly carved out by the erosive forces of wind, rain and ice.

Higher and steeper than hills, mountains are usually at least 600m tall. The highest of them all is Mt Everest, looming 8,850m above sea level. It is part of the Himalayan mountain range. Chains of mountains like these cover around 20 per cent of our planet's surface!

Avalanche

Occasionally, snow piled up on mountains suddenly slips off, tumbling downhill at great speed. Avalanches can knock down trees and bury whole villages!

Snow line

High mountains have snow and ice at their peak all year round – even in summer. The place where this starts is called the snow line.

Skiing

Mountain slopes are popular holiday destinations, as they offer hiking in summer and skiing in winter.

Mountaineering

Some mountains can only be climbed by experts, using equipment such as ice picks, crampon shoes and safety harnesses. Mountaineers face many hazards as they climb, including blizzards and falling rocks.

Mountain weather

Mountains are often covered in clouds and have lots of rain.

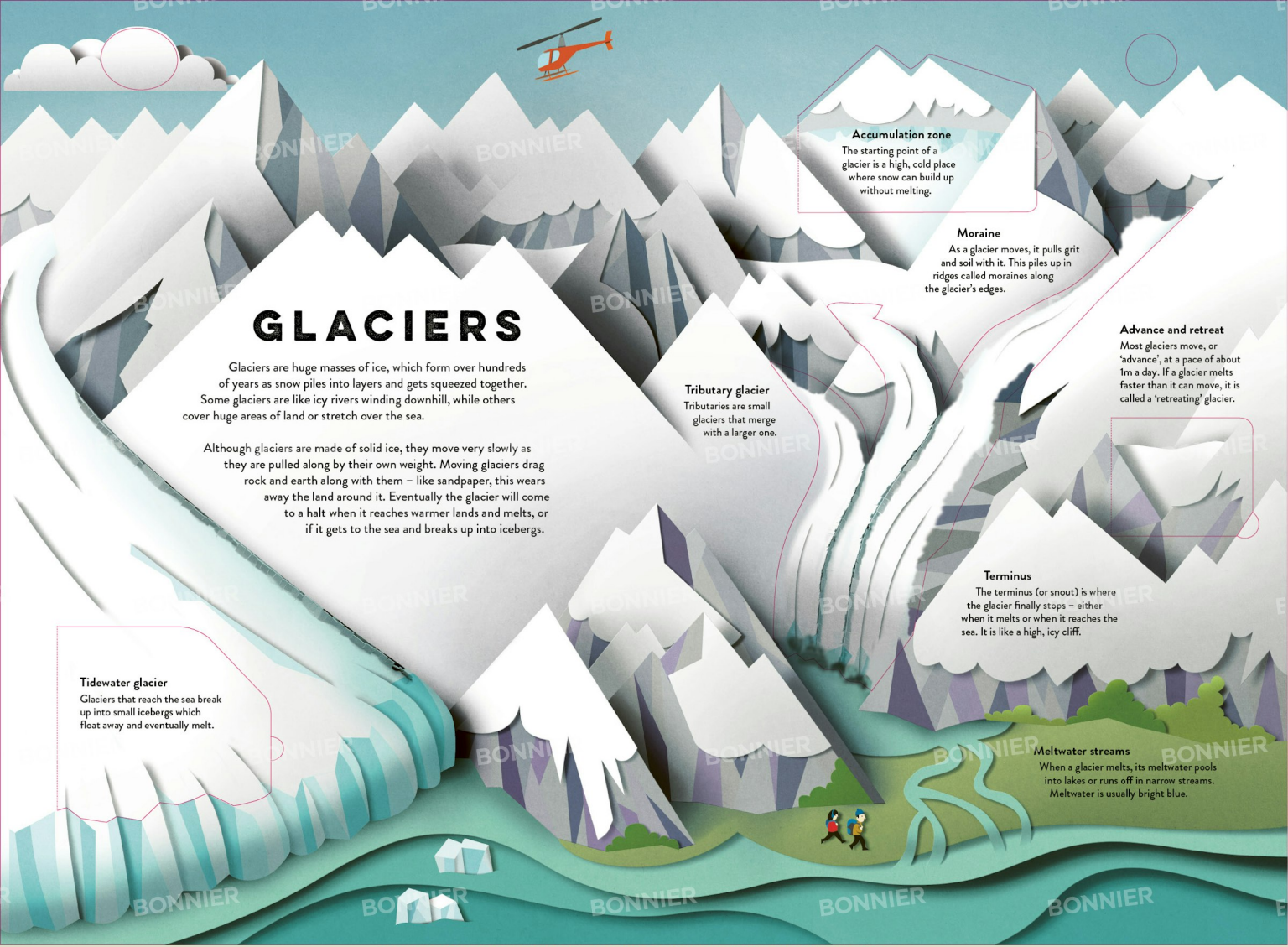
Mountains are so big they can block rain so that one side of a mountain experiences much more rain than the other side!

Peak

The mountain's highest point is its peak, or summit. On high mountains, it is an area of bare rock and snow, but on lower peaks it can still be grassy.

Base

The bottom of the mountain is called the base. Mountains' heights are measured from sea level rather than from their base.



RIVERS

A river is a channel of water that flows downhill towards a sea or a lake. The biggest rivers are thousands of kilometres long, and so wide that you cannot see from one side to the other.

Near its start, a river is narrow and tumbling, as it flows steeply downhill. But lower down, the slope evens out and the river flows smoothly, widening as other streams, rainfall and snowmelt join its course. Along its way, the river will shape the land around it by scraping rocks and gravel against its bottom and sides. Then, as it approaches its end, it will drop its load before finally winding its way out into the open sea.

Source
A river's starting point is called its source. Often in the mountains, it may flow from an underground spring or a pool where rainwater gathers.

Tributary
A river that flows into a larger river or lake is a tributary. The point where rivers meet is called the confluence.

Waterfall
When a river flows over hard and soft rock, it gradually wears the soft rock away until a hard ledge is all that remains. The water cascades over this as a waterfall.

Ox-bow lake
An ox-bow lake is the cut-off loop of a meander. It forms when the ends of the loop get so close together that the river takes a 'shortcut' over the land between them, and takes a new course.

Meander
S-shaped bends occur when rivers flow over gentle slopes, eroding the bank on one side and depositing mud and grit on the other.

Flood plain
The low-lying land around a river can flood if the river's levels rise (due to heavy rain or melted snow). The area that floods is known as the flood plain.

Estuary
Larger rivers may have very wide mouths, called estuaries, where they meet the sea. The mix of fresh and salt water here is called brackish water, and is home to unique wildlife.

CAVES

Under our feet can be a vast, hidden world of twisting tunnels and gaping caves. The biggest, most common caves form when rainwater trickles through the rock and hollows it out over hundreds of thousands of years. Eventually they can result in huge underground passages.

Rainwater is actually slightly acidic, and gradually dissolves rocks such as limestone. As the water passes through the stone, it starts to carry some of the minerals it has dissolved. So when the water drips, it can leave behind traces of minerals, which build up over time to form huge stalactites hanging from cave ceilings. Where water drips onto the cave floor, upward-pointing stalagmites are made instead.

Sinkhole
If the ground above a cave becomes too thin, it can collapse, forming a tunnel-shaped sinkhole.

Cavern
A cavern is an underground space carved out by water as it reacts with chemicals in the stone.

Dripstone features
Features such as stalagmites (which point up) and stalactites (which hang down) are also called dripstone features.

Chimney
Vertical tunnels are called chimneys, or wells. They are carved out by underground waterfalls.

Exploring caves
Potholers are always looking for new caves and seeking adventure. Scientists, called speleologists, also visit caves to study them. A hard hat, protective clothing and a torch are crucial tools underground, where there is always the risk of tight tunnels, floods and nothing to

Siphon
A passageway completely flooded with water is known as a siphon.

Unique wildlife
Caves are home to animals not found anywhere above the ground. The proteus is a cave salamander which has never seen daylight, so is completely blind!

DESERTS

Found on every continent, and covering almost a quarter of the planet's land, deserts are dry, barren places, where there is very little rainfall. Some are boiling by day and cold at night, while others are cold all year round. The largest desert in the world is Antarctica (although icy, it hardly ever snows there).

Over thousands of years, winds and occasional floods can carve desert rocks into strange and beautiful shapes. Eventually, all that remains is the very hardest layers of rock, which may form huge arches or towering pillars.

Mesa
Mesas are steep-sided mountains with flat tops. They form when softer rock is worn away beneath a layer of hard rock.

Plateau
This high, flat area may eventually be eroded to form a smaller mesa or butte.

Butte
A butte is a small mesa.

Natural arch
When wind and sand erode a crack in a rock, it opens up to make an archway.

Wadi
This dried-up riverbed shows where a river once ran through the landscape. Rare flash-floods can transform it into a torrent of water.

Salt flat
Sometimes a pool of salt crystals will remain on the site of an old dried-up lake.

Oasis
Sometimes water springs up from underground, forming a pool in the desert. Plants grow and animals visit to drink, eat and rest in the shade.

Hoodoo
A hoodoo is another name for a tall, thin column of rock.

Sand dunes
Desert winds can shift sand from place to place, piling it up in long, wavy piles called sand dunes.

COASTS

Between the land and the ocean lies a narrow strip of land known as the coast. If you put every strip of coast in the world end-to-end, they would measure more than 500,000km and wrap around the world over 10 times!

Coastlines are constantly changing under the forces of crashing waves, rising tides, water currents and strong winds. Waves pounding against the land carve out caves and arches, and – over time – grind solid rock down to make pebbles and sand. This is then dropped in areas of shallow water, and builds up to form our beaches.

Salt marsh
These low, grassy plains are regularly flooded by the sea.

Harbours
Natural harbours have been used for centuries to keep boats safe from the power of the sea.

Spit
Sand may be swept sideways across the mouth of a river to form a bar or 'spit'.

Sea stack
This pillar of rock is completely cut off from the headland. It usually forms when a sea arch collapses leaving half of it behind.

Headland
This narrow strip of land is surrounded by water on three of its sides.

desert
ocean floor

Coastal erosion
Waves constantly pound the coast, hurling rocks at it, and forcing water deep into existing cracks until they break off slabs of rock.

Sea arch
Sea arches form when waves break through two back-to-back sea caves.

Cliffs
Towering cliffs occur where a high wall of land meets the sea.

Currents
Lateral currents move sideways along the beach and carry sand down the coast. Rip currents move away from shore and can be dangerous for swimmers.

Wave-cut platform
Some cliffs have a flat ledge of rock at their base. This may only be visible when the tide goes out.

Caves
Waves are constantly wearing away the cliffs as they crash against them. The waves open up cracks in the cliff to create caves.

Beach
The sand and pebbles at the beach were all once blocks of rock that fell off a cliff. The sea grinds them down then piles them up in shallow water.

OCEAN FLOOR

Deep beneath the ocean's waves lies the mysterious ocean floor. Covering nearly 70 per cent of the planet's surface, it is largely unexplored. In fact, we know less about the ocean floor than we know about the Moon!

But we do know that the ocean floor is covered in mountains, deep valleys and bubbling volcanoes. Incredibly, three-quarters of the world's volcanic activity occurs underwater! Starting on the sea floor, the volcano Mauna Kea is the tallest mountain in the world from base to tip, measuring around 10,000m – that's 1,150m taller than Mt Everest!

Volcanic island
When a volcano erupts underwater, its lava cools and hardens so that it gradually grows taller and taller. Eventually it may break the water's surface to make an island.

Coral reef
Rings of coral reef grow in the shallow waters around the edge of tropical islands.

Guyot
This is an underwater mountain with a flat top, worn away by erosion.

Seamount
A seamount is an underwater mountain that doesn't break the ocean's surface.

Continental shelf
Beyond the coast, the thick slab of the continent extends underwater for thousands of metres before sloping steeply to the ocean floor.

Deep sea trench
Deep sea trenches form when one tectonic plate moves beneath another.

Abyssal plain
Most of the ocean floor is made up of this wide, flat expanse, at a depth of approximately 4,500m.

Mid-oceanic ridge
The mid-oceanic ridge is a long mountain range that forms where two tectonic plates move away from each other underwater. As magma creeps up between the plates, it cools and hardens to form new sea floor. This is called sea floor spreading.

WEATHER

The weather includes everything that's going on in the air around us, from wind and rain to hot and cold. All weather is driven by the Sun, which heats up air in the atmosphere and makes it move around. Warm air rises, and cool air rushes in to fill the space it leaves behind – this moving air is what we call the wind.

The Sun also makes water evaporate (turn into a gas) and rise up into the sky to form clouds. Some clouds are light and fluffy while others are huge and dark. Different types of clouds bring rain and snow, or the most extreme type of weather – storms!

Vapour trail

When planes fly, they leave a trail of water vapour behind them. At extreme heights, the cold means this turns to ice, which can be seen as a vapour trail.

King of the clouds

Towering cumulonimbus is the biggest type of cloud. It is responsible for rain, hail and snow.

Wind

Air moves around as its temperature changes. Hot air rises and cool air falls. Winds usually mean a change in the weather – they can push away clouds or bring new weather systems with them.

Rainbows

We see rainbows when the Sun shines from behind us through a patch of rain. It forms an arch made of the seven colours in sunlight: red, orange, yellow, green, blue, indigo and violet.

STORMS

When the wind picks up and dark clouds gather in, it looks like a storm is on the way. Storms can range from heavy rain and snow, to thunderstorms, sandstorms or twisting tornadoes. They usually happen when there are sudden changes in the atmosphere, with warm air rising rapidly.

The more severe a storm is, the faster its winds will be. The worst storms have winds faster than a jet plane – they can destroy homes and habitats, and even kill people. When a storm strikes, it is important to stay safe while you wait for it to pass.

Hurricanes

These huge storms form over tropical oceans as hot air rises and spins. In the Indian Ocean they are called cyclones and in the Pacific they are called typhoons. They bring strong winds, heavy rain and huge waves. Their spinning clouds can be seen from space!

Blizzards

Winter storms of wind and snow are called a blizzard. They can make it very difficult to see where you are going, and bring extreme cold.

Weather forecasting

Scientists called meteorologists can predict the weather. They study photographs taken by weather satellites, and look at information gathered at weather stations: special buildings which record temperature, rainfall and wind speed.

GLOSSARY

Atmosphere
A blanket of gases around Earth. It contains the air we breathe, keeps the Earth warm and protects us from the Sun's harmful rays.

Avalanche
A huge, fast cascade of snow down the side of a mountain.

Boundary
The point where two tectonic plates meet.

Climate
The weather over a long period of time.

Core
Earth's inner layer. The outer core is made of hot, molten iron. The inner core is a ball of solid iron at temperatures hotter than 6,000°C.

Crust
Earth's outer layer. The crust over Earth's continents is called continental crust; the crust over the oceans is oceanic crust.

Deep sea trench
Deep sea trenches occur where two oceanic plates converge (move towards each other). Alongside the trench is often a range of underwater volcanoes.

Desert
A very dry area which receives little or no rainfall.

Erosion
The wearing away of rock and soil caused by wind, water and the weather.

Evaporation
The process by which a liquid turns into a gas. Water turns into water vapour (gas) when it is heated up.

Glacier
A slowly moving mass of ice made of layers of compressed snow.

Lava
Molten rock that has been expelled on to Earth's surface.

Magma
Molten rock inside the Earth.

Mantle
The thick middle layer of Earth's interior. Here the rock is so hot that it almost melts and can flow a bit like a liquid.

Mid-oceanic ridge
A long mountain range that forms where two tectonic plates move away from each other underwater.

Mountain
A high peak formed by tectonic movements in Earth's crust.

River
A channel of water that flows downhill towards a sea, lake or other river.

Stalactite
Stalactites hang down from cave ceilings. They build up from mineral deposits left behind by dripping water.

Stalagmite
Stalagmites point up from the ground. They form from mineral deposits left by dripping water.

Tectonic plates
Jigsaw-like pieces that make up the Earth's crust. The tectonic plates are constantly moving, creating mountains, deep sea trenches and earthquakes.

Volcano
A gap in Earth's crust where magma bursts out in an eruption.

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