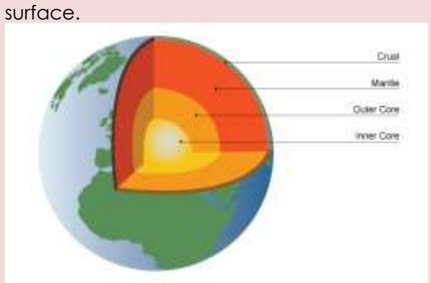
Angry Earth (Volcanoes, Earthquakes and Tsunamis) January 2020 (©Property of Heron Way School)

	Year 3	Year 4	Year 5	Year 6
Vocab ulary	● Topsoil, subsoil, bedrock, crust, mantle, outer core, inner core, iron, nickel, molten, liquid, rock, melt, magma, igneous rocks, pumice, granite, obsidian. ● Volcano - extinct, dormant, active, eruption. ● Earthquake ● Tsunami, wave.	● Topsoil, subsoil, bedrock, crust, mantle, outer core, inner core, iron, nickel, molten, liquid, rock, melt, magma, igneous rocks, pumice, granite, obsidian. ● Volcano - extinct, dormant, active, eruption, lava. ● Earthquake, seismograph, Richter Scale, ● Tsunami, wave.	● Topsoil, subsoil, bedrock, crust, mantle, outer core, inner core, iron, nickel, molten, liquid, rock, melt, magma, igneous rocks, pumice, granite, obsidian. ● Volcano - extinct, dormant, active, magma,lava, hot ash, gas, crater ● Earthquake, seismograph, Richter Scale, shockwave, energy. ● Tsunami, wave, giant wave, ocean floor, underwater landslide. ● Tectonic Plates, continental drift, plate boundary, fault line, friction, slide.	● Topsoil, subsoil, bedrock, crust, mantle, outer core, inner core, iron, nickel, molten, liquid, rock, melt, magma, igneous rocks, pumice, granite, obsidian. ● Volcano - extinct, dormant, active, magma,lava, hot ash, gas, magma chamber, ● Earthquake, seismograph, Richter Scale, shockwave, energy. ● Tsunami, wave, giant wave, ocean floor, underwater landslide. ● Tectonic Plates, continental drift, plate boundary, fault line, friction, slide, Ring of Fire,
Knowl edge	Look at "Under our Feet" lesson and "Journey to the centre of the Earth" lesson. Children build on their learning from KS1. Remind the children of the locations of hot and cold areas of the Earth. Remind the children that the Earth is a sphere. The surface area of the Earth is huge (510 million KM^2. Open questions about what might be inside the Earth? The Earth is made of three layers that are just like an onion. These are the crust, the mantle and the core. Some of these layers have even more layers in them and they are always moving. The Earth is mostly made of rock and metal. As scientists can't really get right to the middle of the earth, it's not easy for them to know what's way down in the middle.There are always new theories coming out as measuring equipment and knowledge improves. **The Core** The core is made of two layers – the inner and outer core. When the Earth formed 4.5 billion years ago, the heavy substances sunk to the middle and these formed the inner core. The lighter ones, like air and water, stayed on the top on the crust. The innermost part of the core is a bit like a solid lead ball, which is about 1,500 miles (2,400 kilometers) thick. That is thick! Under all that pressure, it actually can't melt. Are you ready for this? It is between 9,000 and 13,000 degrees Fahrenheit (4,982 and 7,204 degrees Celsius) in temperature. That is seriously hot and unbelievably it's as hot as the sun's surface. 	Remind the children of the work carried out in Year 3 on the structure of the Earth. What do they remember and what needs to be reinforced to ensure that they have grasped this knowledge? Remind the children about the location of active volcanoes in the UK - were there any? What about the sites of inactive volcanoes? What about the sites of Earthquakes in the UK? Talk about the distribution of these and get the children to question why they only seem to occur in certain areas? What might this tell us? What do the children think influences the sites of volcanoes? Perhaps they need to look further afield - study the volcanic activity in Europe. How does this compare to the UK? Are all volcanoes in Europe extinct like the UK? Are they all therefore inactive like the UK?  What do the children notice about the locations of volcanoes? How does this compare to the location of Earthquakes in Europe? What pattern can they see? Now refer back to the UK maps of earthquakes and volcanoes - does this follow a similar pattern? What can we deduce? That where you have volcanic activity you also have Earthquake activity - look at how we measure how	Remind the children of the work that they carried out in Year 3 and Year 4. What have they learnt about Volcanoes, Earthquakes and Tsunamis. MAKE SURE THEY KNOW: ● There are no longer any active volcanoes in the UK ● Where in the UK we tend to get Earthquakes and ancient volcanoes. ● Where in Europe we tend to get ACTIVE volcanoes. Remind the children of Active, Dormant and Ancient. Where in Europe we have had the most powerful Earthquakes. ● What did the children notice about the location of these? How powerful were the European Earthquakes compared to the UK earthquakes? ● Waves are produced by the wind blowing across the surface of an ocean/sea. ● Tsunamis are caused by movement of the Earth underneath the sea bed, or an underwater landslide, or something massive dropping in the ocean. **Ask the question:** Why is there a pattern in where Earthquakes and Volcanoes are located? Why is there also a link to where the largest Tsunamis have been recorded? Same regions? If a tsunami is caused by a movement of the Earth - then what on Earth causes this movement? **Plate Tectonics.** This is the grand reveal for the children. This will answer the question to the patterns we have in earthquakes, volcanoes and tsunamis. First we have to go back in time and look at the Earth. (Here we introduce the idea of continental drift) Look at the plate boundaries worksheet and show how the different plates moving cause different events! Does this further explain where these events happen?	In this unit the children tie all of their knowledge together. They look at the tectonic plates around the world and look at the frequency and strength of volcanoes, earthquakes and tsunamis. What do they notice about the location of volcanoes and earthquakes on a world map? **HOW DOES IT COMPARE TO THE UK AND WHY?** **RING OF FIRE** The Earth's surface is made up of several tectonic plates which are constantly moving, although very very slowly. Where tectonic plates are being pushed together, some of the Earth's crust is pushed deeper into the Earth's mantle where it melts and rises to the surface again to form volcanoes. A large area where this occurs on earth is called the Pacific Ring of Fire and is shown on these globes.   Where tectonic plates are being pushed apart, openings in the Earth's crust allows molten rock to escape, forming volcanoes. An area where this occurs on earth is called the Mid-Atlantic Ridge and is shown on this globe.

When you consider that a kettle reaches 212 degrees Fahrenheit (100 degrees Celsius) at boiling point, then you can imagine just how hot the inside of the Earth is!

The inner core is said to spin at a different speed to the rest of the planet causing the Earth's magnetic field.
The second layer of the core is made of liquid iron and nickel and is about 1,400 miles (2,300 kilometers) thick.

Some people have said that it is actually 3,200 miles (5,150km) thick and 7,200 to 9,000 degrees Fahrenheit (3,982 to 4,982 degrees Celsius) in temperature.

It is because of the flow of metals in this inner core that the Earth is magnetic.

The influence of this magnetic field extends beyond the Earth far into space and forms a barrier that helps protect the Earth from the Sun's destructive solar winds. Wow that's interesting.

The Mantle
The mantle is about 1,800 miles (2,900 kilometers) thick and makes up about 85% of the Earth's weight.

It is made of molten (melted) iron, minerals and other semi-solid rocks that can flow under pressure.

It is thought that when the rocks rise due to the very intense heat and then cool, this means that they sink back to the core and this movement causes the crust to break into sections, or plates.
When these move and crash into each other it causes earthquakes and volcanic eruptions. It is because of this movement that mountains and new sea floors are formed.

Sea floors are made of a thick rock called basalt which press into the mantle and then fill with water.

The various continents are made from lighter blocks that float on the mantle like massive icebergs.

When the mantle layer is explored they usually do it from the sea bed where the layer is thinner than on land.
The first time they explored the mantle was in 1996, but they eventually gave up as they just couldn't get it right.

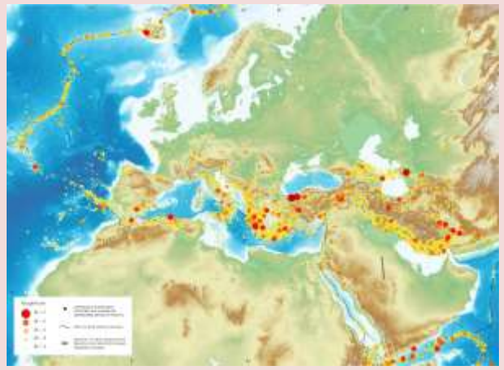
In 2007, scientists drilled to 23,000 feet (7,000 m) below the seabed from a Japanese ship called Chikyu, in an area between Cape Verde Islands and the Caribbean Sea.

This drilling was three times deeper than any other previous drillings that they had done.

The Crust
The crust is an outer solid layer and is where life as we know it exists with mountains, sea and soil. It is about 3-5 miles (5 – 8 kilometers) thick in the ocean bed.

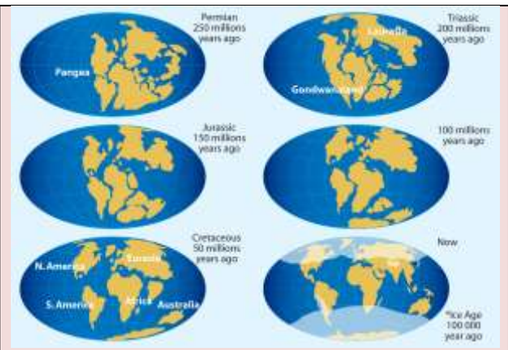
It is mostly made from basalt rock and is around 25 miles (40 kilometers) thick on land which is mostly made from granite rock.

bad an earthquake is - it is using a seismograph so we call this seismic activity. It is measured on something called the Richter Scale. Look at the most powerful Earthquakes in Europe and compare the Richter scale readings to the Uk.



Below shows the most powerful quakes in Europe in the last 120 years.

66 years ago 7.8 magnitude, 626 km depth
Dúrcal, Andalusia, Spain
79 years ago 7.8 magnitude, 90 km depth
Nereju Mic, Vrancea, Romania
64 years ago 7.7 magnitude, 20 km depth
Amorgós, South Aegean, Greece
20 years ago 7.6 magnitude, 17 km depth
İzmit, Kocaeli, Turkey
53 years ago 7.4 magnitude, 30 km depth
Hendek, Sakarya, Turkey
114 years ago 7.4 magnitude, 15 km depth
Patitírion, Thessaly, Greece
39 years ago 7.3 magnitude, 10 km depth
Chlef, Chlef, Algeria
72 years ago 7.3 magnitude, 15 km depth
Koróni, Peloponnese, Greece
72 years ago 7.3 magnitude, 15 km depth
Kárpathos, South Aegean, Greece
67 years ago 7.3 magnitude, 10 km depth
Gönen, Balıkesir, Turkey



Look at continental drift picture 1 - Below. This is how the countries appeared 300 million years ago. Then move through the next set of pictures. Where were the countries and where are they now? Children need to understand that the continents split apart from one land mass. What caused the continents to split apart? The movement of the Earth's "plates" split the land mass over time. Watch the videos on plate tectonics - they are excellent!

Start to look at volcanoes - Now that the children understand about plate tectonics they can use this knowledge to revise their knowledge of the location of volcanoes in the Uk and Europe.

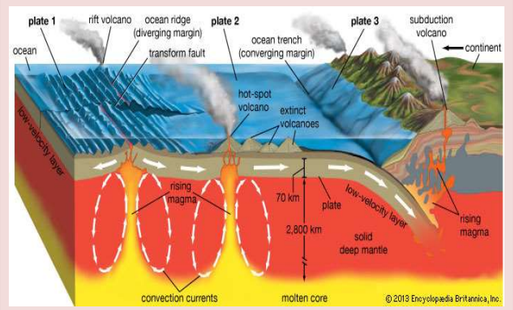
Understand that the UK is now a long way away from the edge of a plate, as it has drifted over time - this is why all of our volcanoes are extinct.
A volcano is an opening in the Earth's crust that allows magma, hot ash and gases to escape. Volcanoes can look like mountains or small hills, depending on what type they are.

Magma is molten rock - rock that is so hot it has turned into liquid. When magma reaches the surface of the Earth it is called lava and comes out of the volcano as a volcanic eruption, along with gases and ash.

Earthquakes
The Earth is made up of different layers:

the core at the centre, which is mainly metal
the mantle, which is mainly rock

Volcanoes can also form in areas where there is a hotspot in the mantle. This is an extra hot plume of molten rock which causes the earth's crust to thin allowing molten rock to escape onto the surface. The movement of the earth's tectonic plates means that volcanoes form a trail along the earth's surface.



Volcanic eruptions
Most volcanic eruptions are caused by tectonic plates moving towards each other, which usually produces violent eruptions. Other volcanoes, such as Mauna Loa in Hawaii are caused by hot spots in the Earth's crust. These do not erupt violently and lava usually flows slowly out of them.

This is the only layer of earth that can be investigated by drilling into it. So we know way more about his layer than any of the others!

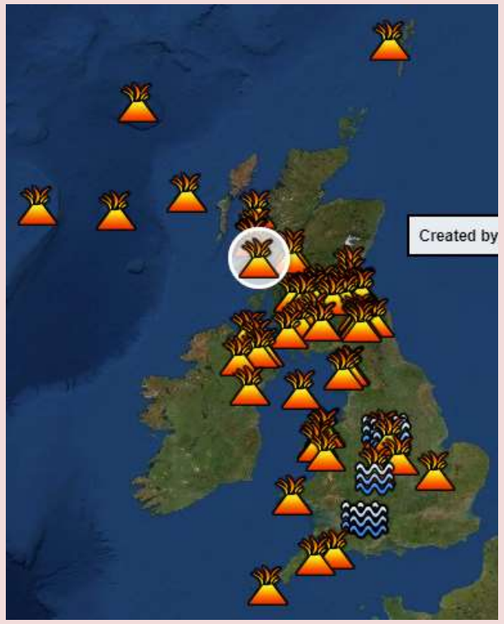
Explain to the children that what lies underneath our feet effects the location of active volcanoes, earthquakes and tsunamis.

Focus on the UK and look explore the fact that there are no longer any active volcanoes in the UK. However this has not always been the case.

https://www.heritagedaily.com/2018/09/volcanic-map-of-the-united-kingdom/121724

https://www.wanderlust.co.uk/content/uk-volcanoes-must-visit/

What do the children notice about the location of volcanoes in the UK?



Compare this with sites of Earthquakes in the UK. What can they deduce? What questions can they ask you? What might they try and find out?

What do the children notice about the location of these?

https://sciencestruck.com/active-volcanoes-in-europe

Below shows the most powerful quakes in the UK

36 years ago 5.0 magnitude, 12 km depth
Criccieth, Wales, United Kingdom

17 years ago 4.8 magnitude, 9 km depth
Kingswinford, England, United Kingdom

12 years ago 4.8 magnitude, 18 km depth
Market Rasen, England, United Kingdom

19 years ago 4.7 magnitude, 10 km depth
Shetland, Scotland, United Kingdom

30 years ago 4.7 magnitude, 18 km depth
Presteigne, Wales, United Kingdom

13 years ago 4.6 magnitude, 10 km depth
Hythe, England, United Kingdom

20 years ago 4.5 magnitude, 10 km depth
Glyn-neath, Wales, United Kingdom

What can the children deduce from the information about the magnitude of the Earthquakes? In comparison with Europe?

Remind the children of how waves are formed in the sea (wind blowing across the surface) Explain that a giant wave or Tsunami can also be formed when there is a movement of the Earth underneath water (usually from an Earthquake) or an underwater landslide. Use the following link to determine where the most powerful Tsunamis have ever been recorded:

the crust, which is the part we can see
The crust (together with the upper layer of the mantle) is made up of different pieces, called plates. These plates fit together like a jigsaw and are moving at a rate of a few centimetres a year, in different directions and at different speeds.

Some plates slide past each other, others move away from each other and some bump into each other. Sometimes these plates lock together when they meet. This is called a plate boundary or a fault line.

What are earthquakes?

As plates carry on moving in different directions over long periods of time, friction causes energy to build up. Eventually it becomes so great that the energy is released, which creates a shock wave - an earthquake. If the earthquake is beneath the ocean it can create a huge tidal wave, called a tsunami.

There are thousands of earthquakes across the world each day and some are so small that they can only be detected by specialist equipment. Others can be so intense that they can create lots of damage and destroy towns and cities. The Richter magnitude scale is used to measure the size of earthquakes.

Many earthquakes occur around the Pacific Ocean. People who live there, in countries such as Japan, are used to earthquakes happening and build earthquake-resistant buildings that sway with the shock waves rather than fall down.

Although there are earthquakes in the UK, they are rare and so small that most people do not feel them.

A tsunami (soo-NAH-mee) is one of the world's most powerful and destructive natural forces.

They can speed across the ocean as fast as a jet plane, swallow up islands and wipe out villages.

But what causes tsunamis…?

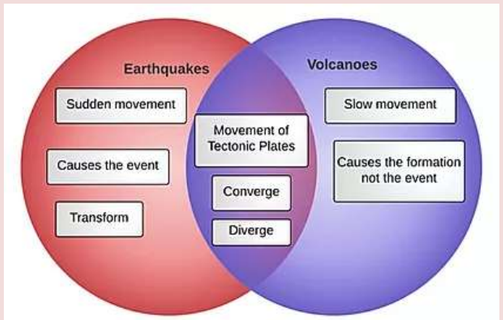
Meaning "great harbour wave" in Japanese, tsunamis are sometimes called "tidal waves" but their strength has nothing to do with the tides. Giant slabs of the Earth's crust, called tectonic plates, grind together. Sometimes, though, the plates get stuck, the pressure builds up and they suddenly slam into a new position. This causes an earthquake. If an earthquake lifts or drops part of the ocean floor, the water above rises and starts spreading across the ocean, causing a tsunami. Underwater landslides or volcanic eruptions can also displace water (cause water to spread across the ocean) and may lead to a tsunami.

THE DIAGRAM FOR YEAR 6 IN THE APPENDIX shows the relationship between volcanic activity and Earth's tectonic plates. Stratovolcanoes tend to form at subduction zones, or convergent plate margins, where an oceanic plate slides beneath a continental plate and contributes to the rise of magma to the surface. At rift zones, or divergent margins, shield volcanoes tend to form as two oceanic plates pull slowly apart and magma effuses upward through the gap. "Hot spot" volcanoes may form where plumes of lava rise from deep within the mantle to Earth's crust far from any plate margins. Eruptions from volcanoes can be very dangerous. They can produce:

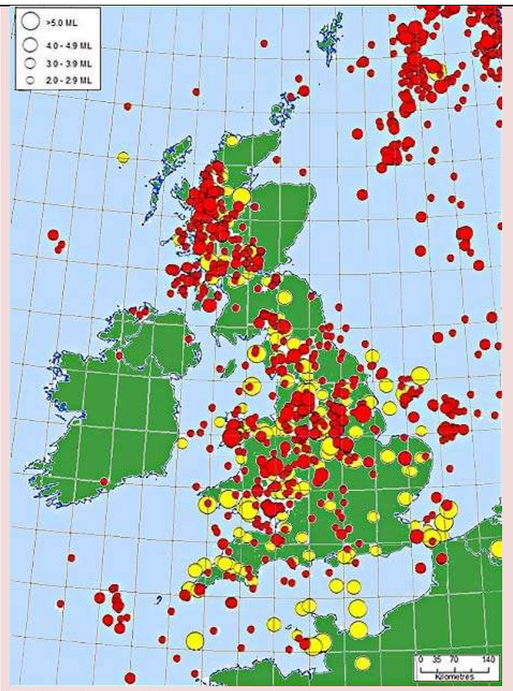
pyroclastic flows - fast moving clouds of hot ash, gas and rock
ash clouds - small pieces of rock and glass that can be carried in the air for many kilometres
volcanic bombs - large bits of very hot rock blown out of a volcano
Volcanoes can, however, help people living near them earn money by bringing in tourists to the area and improving the soil so that crops can be grown.

Earthquakes

Look at earthquakes and where they are located. Compare Earthquakes with volcanoes. Does this also follow the ring of fire? What is the difference between an earthquake and volcanoe?



The above shows the location of 15000 earthquakes. What do the children notice about this - compared to volcanoes and tsunamis? Look at the diagram in the appendix - The largest earthquakes in history. Can the children locate



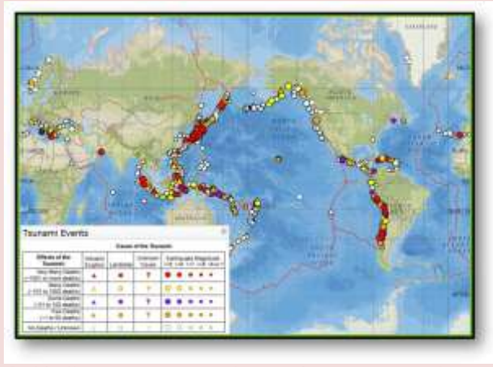
Talk to the children about volcanic activity and earthquakes that happen out in the sea. Explain that sometimes this can create a giant wave called a Tsunami - relate this to the weather and remind/introduce how waves are formed on the ocean in normal conditions (Wind blows against the surface of the water) Leave the next level of knowledge for Years 4-6 on Tsunamis.

https://en.wikipedia.org/wiki/List_of_tsunamis_in_Europe

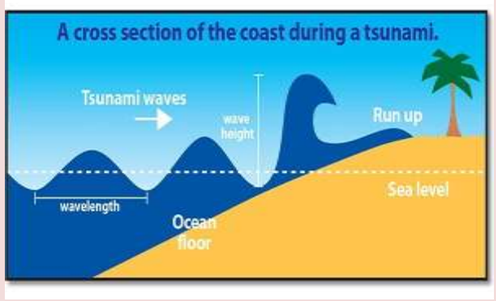
Notice that Italy and Greece feature on this table a lot! What does this tell you about the connection between Tsunamis, Earthquakes and Volcanoes? This is all about making connections and starting to deduce that there are patterns to where these events occur - so there must be a reason for the pattern. Explain that the children will look beneath the Earth in Year 5 to understand more about the patterns to these ground shifting events!

these on a map using their map skills and compare this to the ring of fire?

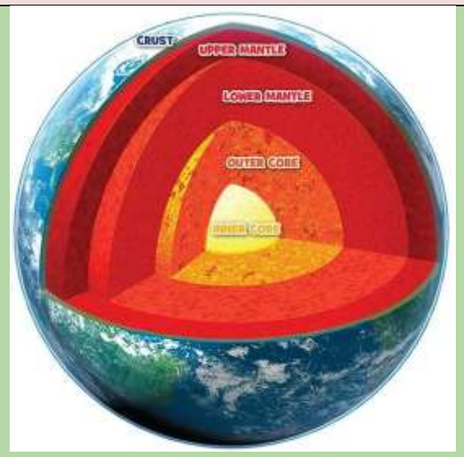
Check the vocab and diagrams in the appendix - can the children explain how an earthquake occurs?



Out in the open ocean, tsunami waves are only about one-metre high because the water is deep. However, as the water becomes shallow, the waves slow down and begin to grow. They can rise 35m or higher – that's the same as a 10-floor block of flats! However, the scariest thing about a tsunami is its wavelength, as this determines how far inland it can travel. Whereas a large wave caused by a storm might have a wavelength of up to 150m, a tsunami could reach up to a fearsome 1,000km!



How Fast?
A normal wind wave travels at about 90kmh, but a tsunami can race across the ocean at an incredible 970kmh! Sometimes, before a tsunami hits, there is a

				huge vacuum effect, sucking water from harbours and beaches. People can see the ocean floor littered with flopping fish and other sea animals. Then a wave blasts onto the shore minutes later, then another and another for two hours or more. There may also be up to one hour between each wave. **Can you predict when a tsunami is coming?** To save lives, scientists established the Pacific Tsunami Warning System, based in Hawaii, in the USA. Its network of detectors can track quakes that may cause a tsunami. These waves can race from one side of the Pacific Ocean to the other in less than a day, so people need to be warned in time to head for higher ground!
Further Knowledge	 ● **Inner Core** Temperature: 5,000°C – 6,000°C State: Solid Composition: iron and nickel The Earth's inner core is a huge metal ball, 2,500km wide. Made mainly of iron, the temperature of the ball is 5,000°C to 6,000°C – that's up to 6,000 times hotter than our atmosphere and scorching enough to make metal melt! The metal at the inner core stays solid because of the incredible pressure surrounding it. **Outer Core** Temperature: 4,000°C – 6,000°C State: Liquid	There are over 60 active volcanoes located in various parts of Europe. Two of the best known volcanoes of the world; Mount Vesuvius and Mount Etna are located in Europe. A volcano is typically a mountain with a rupture or a vent through which molten lava, gases, and ash erupt from a magma chamber below. There are numerous underwater volcanoes located in the seas and oceans of the earth making it difficult to pinpoint the exact number of volcanoes in existence. Volcanoes are classified into active, dormant, and extinct. Most geologists and scientists define an active volcano as one that has erupted in the past 10,000 years. This makes way for the possibility of an eruption at any time. An extinct volcano is one that is unlikely to erupt again. Understanding a volcano's lifespan, however, is not easy. There are numerous volcanoes which are now inactive but could possibly roar back into life. These are called dormant volcanoes. Here's a look at some of the most prominent volcanoes in Europe: Italy: Amiata, Campi Flegrei (Phlegrean Fields), Campi Flegrei Mar Sicilia, Etna, Ischia, Monte Albano, Pantelleria, Vesuvius, Vulsini Germany: Kaiserstuhl, Laacher See, Vogtland volcanic area	volcano is directly stemming from the name, 'Vulcano,' a volcanic island in the Aeolian islands of Italy, which in-turn has its name rooted from the word 'Vulcan,' meaning 'God of Fire' in Roman mythology. A volcano bringing out the earth's interior materials to the surface level, in the form of ash, lava and gases is the effect of a volcanic eruption. This has attracted geologists to study the erupted materials in order to gain insights on the earth's inner matter. The study of volcanoes by these geologists is called volcanology. A volcanologist studies the eruptive activities, formation of volcanoes as well as collect the materials from the eruption to understand and predict the next eruption in order to manage disasters and corresponding earthquakes. A volcano is a rupture in the earth's surface, on the crust layer, that allows the escape of lava, volcanic ash and gases from a magma chamber in the earth's inner layers. An active volcano is a type of volcano that has erupted at least once in the last 10,000 years. A currently erupting volcano is categorized as an active volcano whereas the one bound to erupt in the near future is a dormant type of active volcano. The distinction varies since the lifespan of the volcanoes can spread from months to several million years, but it is largely the underneath activity in the earth's interior, that helps define the kind of volcano and predict its eruption to a certain level.	

	Composition: iron, nickel, sulphur and oxygen This liquid layer of iron and nickel is 5,150km deep. The outer core flows around the centre of the Earth, and the movement of the metals creates our planet's magnetic field. **Lower Mantle** Temperature: 3,000°C State: solid Composition: iron, oxygen, silicon, magnesium and aluminium The lower mantle is found between 670km and 2,890km below the surface, and is made from solid rock. The rock is hot enough to melt, but is solid because of the pressure pushing down on it. **Upper Mantle** Temperature: 1,400°C – 3,000°C State: liquid / solid Composition: iron, oxygen, silicon, magnesium and aluminium This layer is up to 670km below the Earth's surface. The lower part of the upper mantle is made from both solid and melted rock (liquid), while the rock in the upper region is stiffer, because it's cooler. **Crust** Temperature: Around 22°C State: Solid Composition: Oceanic crust made up of iron, oxygen, silicon, magnesium and aluminium. Continental crust made up of granite, sedimentary rocks and metamorphic rocks. The Earth's surface is covered by its thinnest layer, the crust. Land is made of continental crust, which is 8km to 70km thick and made mostly from a rock called granite. The layer beneath the ocean bed is made of oceanic crust, which is about 8km thick and made mainly from a rock called basalt.	Spain: Madeira Madeira Olot Field Canary Islands: El Hierro, Fuerteventura , Gran Canaria , La Gomera , La Palma , Lanzarote, Tenerife Armenia: Aragats, Dar-Alages, Ghegam, Porak, Stromboli, Tskhouk-Karckar Greece: Kolumbo, Methana, Milos, Nisyros, Santorini, Sousaki Azores: Agua de Pau, Corvo, Don Joao de Castro Bank, Fajã de Cima, Fayal, Flores, Furnas, Graciosa Pico, Monaco Bank, Picos Volcanic System, Sete Cidades, San Jorge, Terceira Turkey: Acigöl-Nevsehir, Akyarlar, Ararat, Erciyes Dağ, Girekol, Göllü Dağ, Hasan Dagi, Karaca Dağ, Karadağ, Karapinar, Kars, Kenger, Koruhüyüğü, Kula, Nemrut Dağ, Sandal, Süphan Dağ, Tendürek Dağ Iceland: 130 volcanoes including Katla, Hekla, Bárðarbunga, and Grímsvötn The one volcano in Europe that deserves special mention is Mount Etna. At 10,926 feet (3330 meters) tall, Mount Etna is located on the eastern coast of the island of Sicily in Italy. It has earned the fierce reputation of being the largest and most active volcano in the continent. Apart from this, it also has set the record for the longest continuous eruption. The volcano is a live entity and spews ash, gas, or lava several times a year. The last major eruption, though, occurred in 1992. Recently researchers of seismic activity have suggested that four of Iceland's 130 volcanoes may erupt soon, triggered by earthquakes in the region. Katla in particular seems priming for an eruption. The last eruption on the island (Eyjafjallajökull) in 2010 came at cost of about $4.9 billion.	The presence of volcanoes is largely found in the converging or diverging plate tectonics of the earth, which float on the softer and hotter layer of mantle. These are due to the breaking of the earth's crust as well as its stretching and thinning. These volcanic rich regions are called the hotspots of the earth. There are approximately 500 volcanoes on the earth's surface. Hence, there arises a need to learn a few of the active volcanoes to understand their composition, type and understand the properties of these volcanoes and its eruptions.	

Continental Drift 1.

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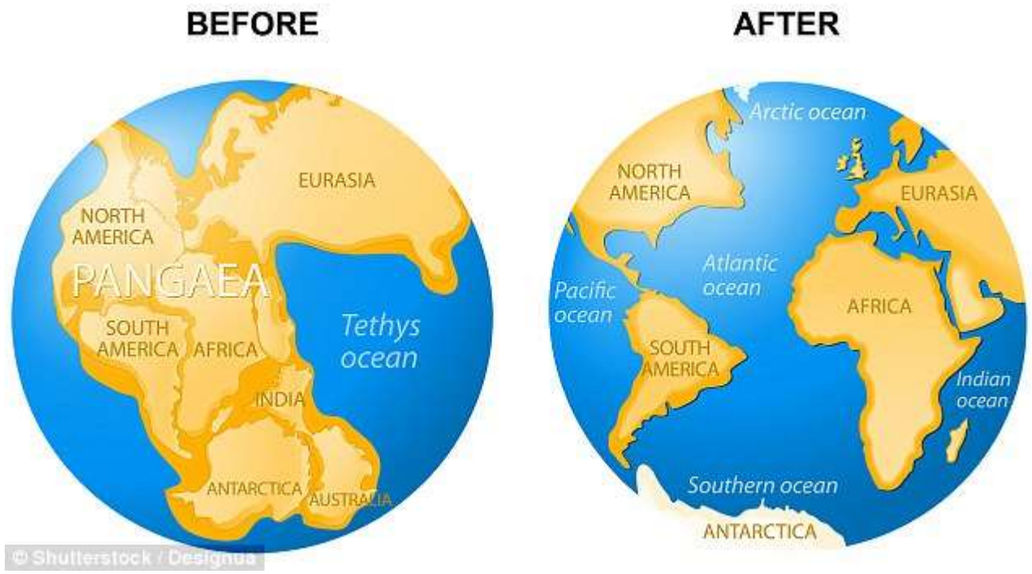
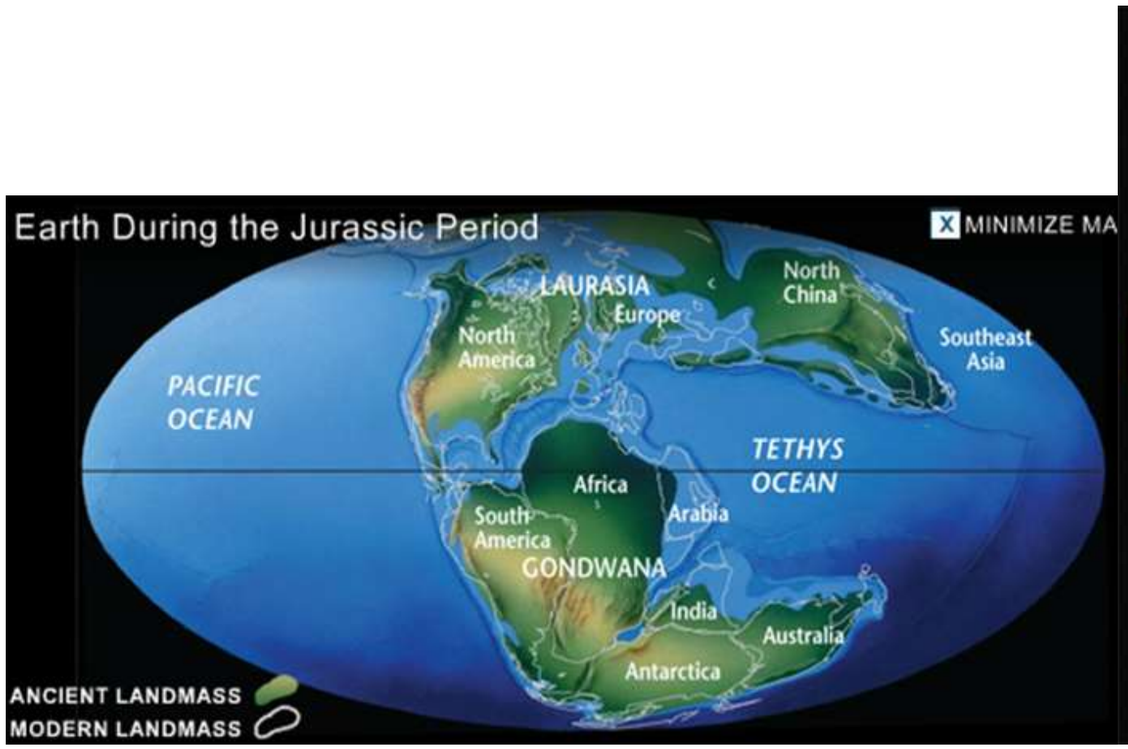
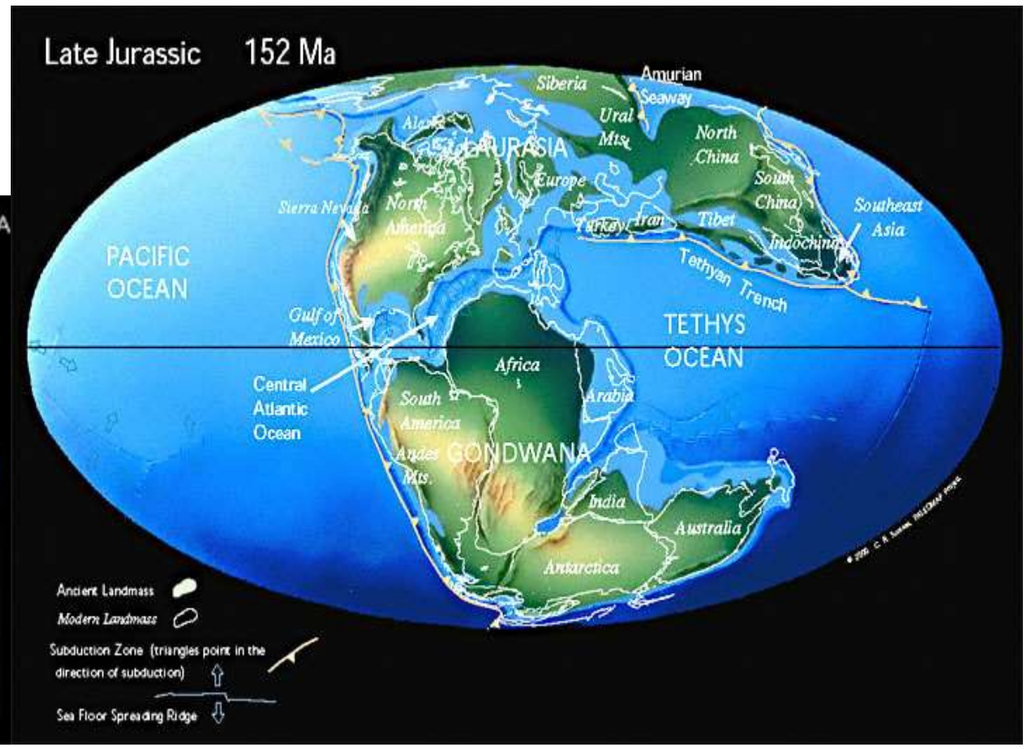


Continental drift 2.





Year 6 could use this to locate the Earthquakes on a world map using their map skills?

Largest Earthquake in history

These earthquakes are measured or estimated to be the largest in history. They are measured using the Richter scale and some of the biggest earthquakes ever have occurred in recent times.

Date	Name	Magnitude
May 22, 1960	1960 Valdivia earthquake	9.5
Mar 27, 1964	1964 Alaska earthquake	9.3
Dec 26, 2004	2004 Indian Ocean earthquake	9.2
Mar 11, 2011	2011 Tōhoku earthquake	9.0
Nov 4, 1952	1952 Kamchatka earthquake	9.0
Aug 13, 1868	1868 Arica earthquake	9.0 (est.)
Jan 26, 1700	1700 Cascadia earthquake	8.7–9.2 (est.)
Jul 9, 869	869 Sanriku earthquake	8.9 (est.)
Dec 2, 1611	1611 Sanriku earthquake	8.9 (est.)
Apr 2, 1762	1762 Arakan earthquake	8.8 (est.)
Nov 25, 1833	1833 Sumatra earthquake	8.8 (est.)
Jan 31, 1906	1906 Ecuador–Colombia quake	8.8
Feb 27, 2010	2010 Chile earthquake	8.8
Aug 15, 1950	1950 Assam–Tibet earthquake	8.7
Oct 28, 1707	1707 Hōei earthquake	8.7 (est.)
Jul 8, 1730	1730 Valparaiso earthquake	8.7 (est.)
Nov 1, 1755	1755 Lisbon earthquake	8.7 (est.)
Feb 4, 1965	1965 Rat Islands earthquake	8.7
Oct 28, 1746	1746 Lima–Callao earthquake	8.6 (est.)
Mar 28, 1787	1787 Mexico earthquake	8.6 (est.)

Vocab that the children should understand about Earthquakes:

Angry Earth (Volcanoes, Earthquakes and Tsunamis) January 2020 (©Property of Heron Way School)

Aftershock- A smaller earthquake following the main shock of a large earthquake. The Tohoku Earthquake of 2011 had over 11000 aftershocks.

Convergent plate boundaries- Also known as a destructive plate boundary, this is where two tectonic plates move towards each other and collide. One plate is forced underneath the other being destroyed in the process.

Crust- The outermost, solid layer of the earth

Disaster- A natural hazard becomes a disaster when there is significant damage to property and/or loss of life.

Earthquake- A sudden violent shaking of the ground, typically causing great destruction, as a result of movements within the earth's crust.

Epicentre- The point on the earth's surface vertically above the focus of an earthquake.

Faults- A fracture in a rock formation along which there has been movement of the rocks on either side of the fracture.

Fault line- The line on a rock surface or the ground that traces a geological fault.

Focus- The place of origin of an earthquake or moonquake.

Landslides- - A collapse of a mass of earth or rock from a mountain or a cliff.

Liquefaction - Is a phenomenon where the shaking of the earth by an earthquake reduces the strength and stiffness of the soil and forces the liquid in the soil to rise to the surface.

Magnitude- The size of an earthquake as measured by the energy released.

Megathrust earthquakes- A megathrust earthquake is a very large earthquake that occurs in a subduction zone where one plate is forced under another.

Mercalli scale- A twelve point scale for expressing the local intensity of an earthquake ranging from I (virtually imperceptible) to XII (total destruction)

Natural hazard- A natural hazard is an extreme event that occurs naturally and causes damage to property and loss if life.

Plates- The earth's crust is cracked into different pieces called tectonic plates. Earthquakes can often be found at the plate boundaries.

Plate boundary- Where two tectonic plates meet.

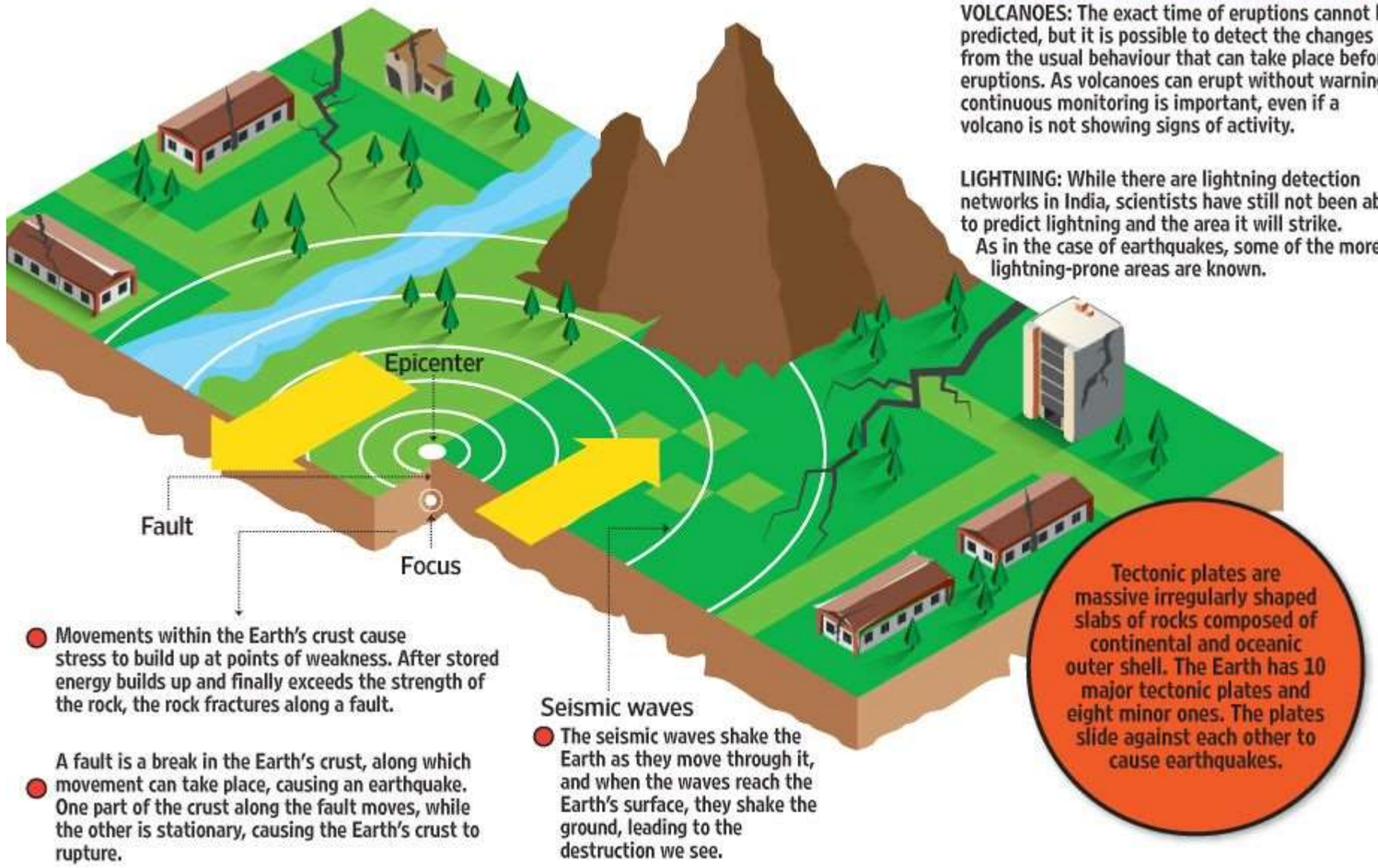
Richter scale- A way of measuring earthquakes. It is a logarithmic scale so that a difference of one has a roughly thirty fold difference in size.

Ring of fire- The zone of activity surrounding the Pacific Ocean and the Pacific plate.

Seismograph- Also called a seismometer. An instrument designed to measure earthquakes. It measures their duration and size.

Tsunami- A long high sea wave caused by an earthquake or other event

HOW AN EARTHQUAKE OCCURS



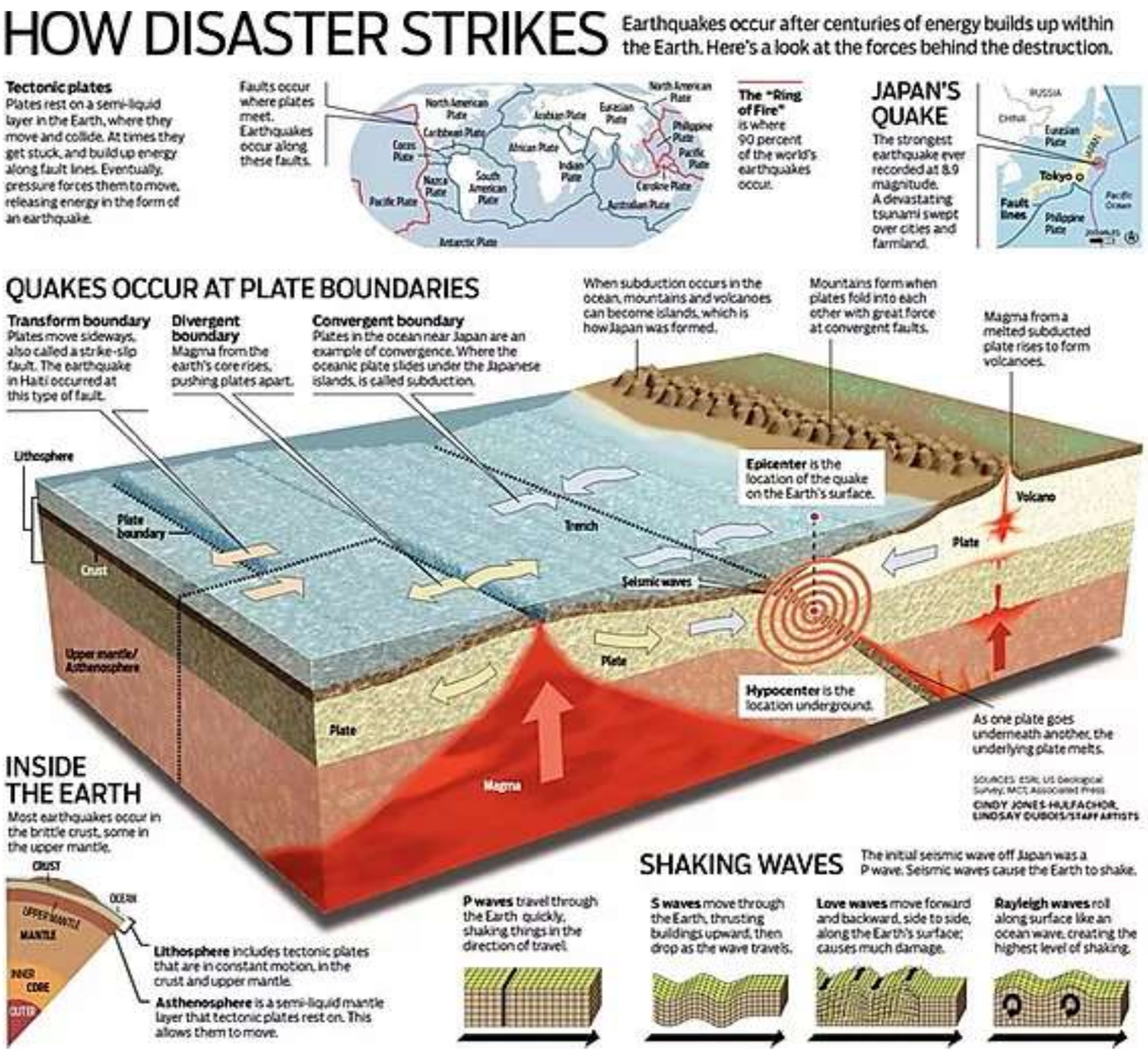
- Movements within the Earth's crust cause stress to build up at points of weakness. After stored energy builds up and finally exceeds the strength of the rock, the rock fractures along a fault.
- A fault is a break in the Earth's crust, along which movement can take place, causing an earthquake. One part of the crust along the fault moves, while the other is stationary, causing the Earth's crust to rupture.
- The seismic waves shake the Earth as they move through it, and when the waves reach the Earth's surface, they shake the ground, leading to the destruction we see.

HARD TO PREDICT NATURAL DISASTERS

VOLCANOES: The exact time of eruptions cannot be predicted, but it is possible to detect the changes from the usual behaviour that can take place before eruptions. As volcanoes can erupt without warning, continuous monitoring is important, even if a volcano is not showing signs of activity.

LIGHTNING: While there are lightning detection networks in India, scientists have still not been able to predict lightning and the area it will strike. As in the case of earthquakes, some of the more lightning-prone areas are known.

Tectonic plates are massive irregularly shaped slabs of rocks composed of continental and oceanic outer shell. The Earth has 10 major tectonic plates and eight minor ones. The plates slide against each other to cause earthquakes.



BY YEAR 6 THE CHILDREN NEED TO BE ABLE TO UNDERSTAND THE DIAGRAM BELOW!

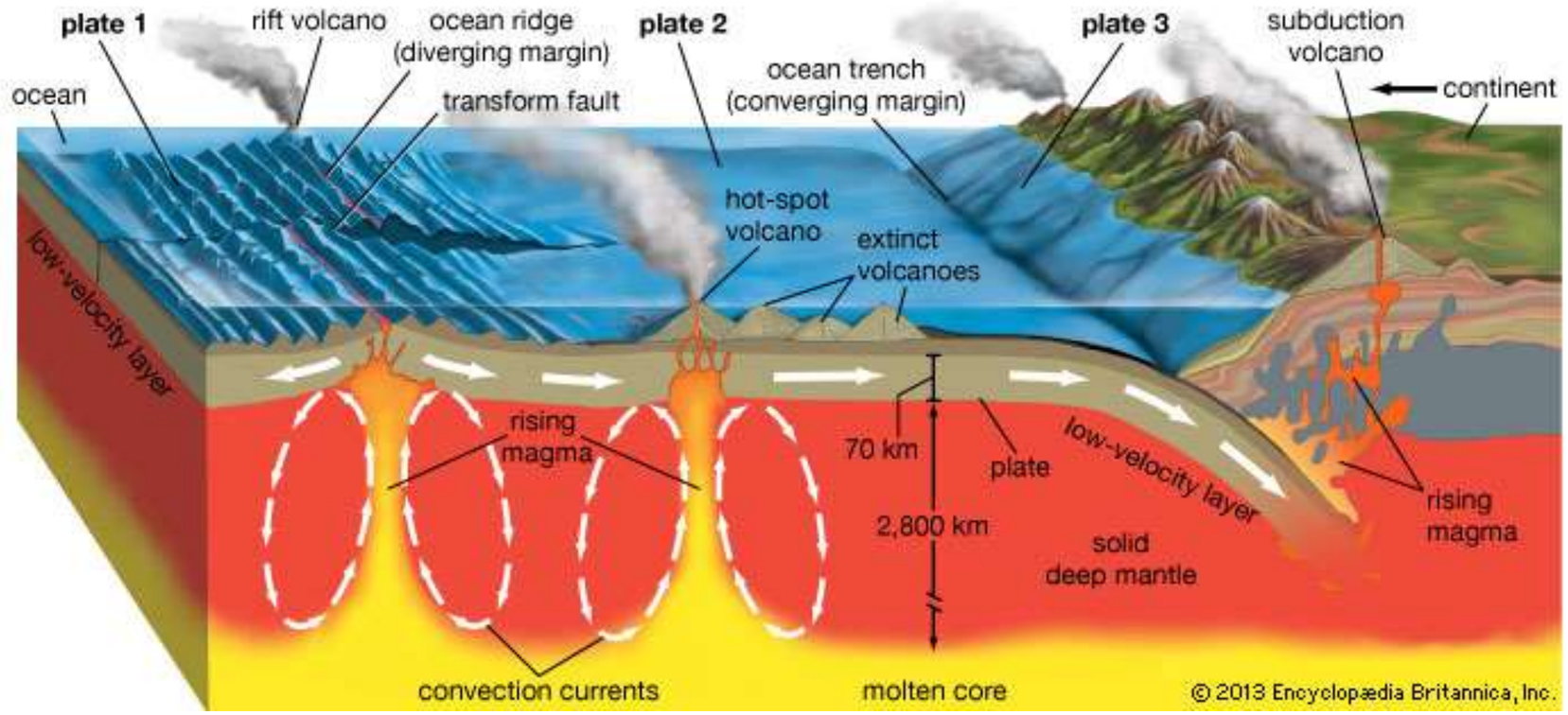


plate 1
rift volcano
ocean ridge
(diverging margin)
plate 2
plate 3
subduction
volcano
ocean
transform fault
ocean trench
(converging margin)
continent
hot-spot
volcano
extinct
volcanoes
low-velocity layer
rising
magma
70 km
plate
low-velocity layer
rising
magma
2,800 km
solid
deep mantle
convection currents
molten core
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