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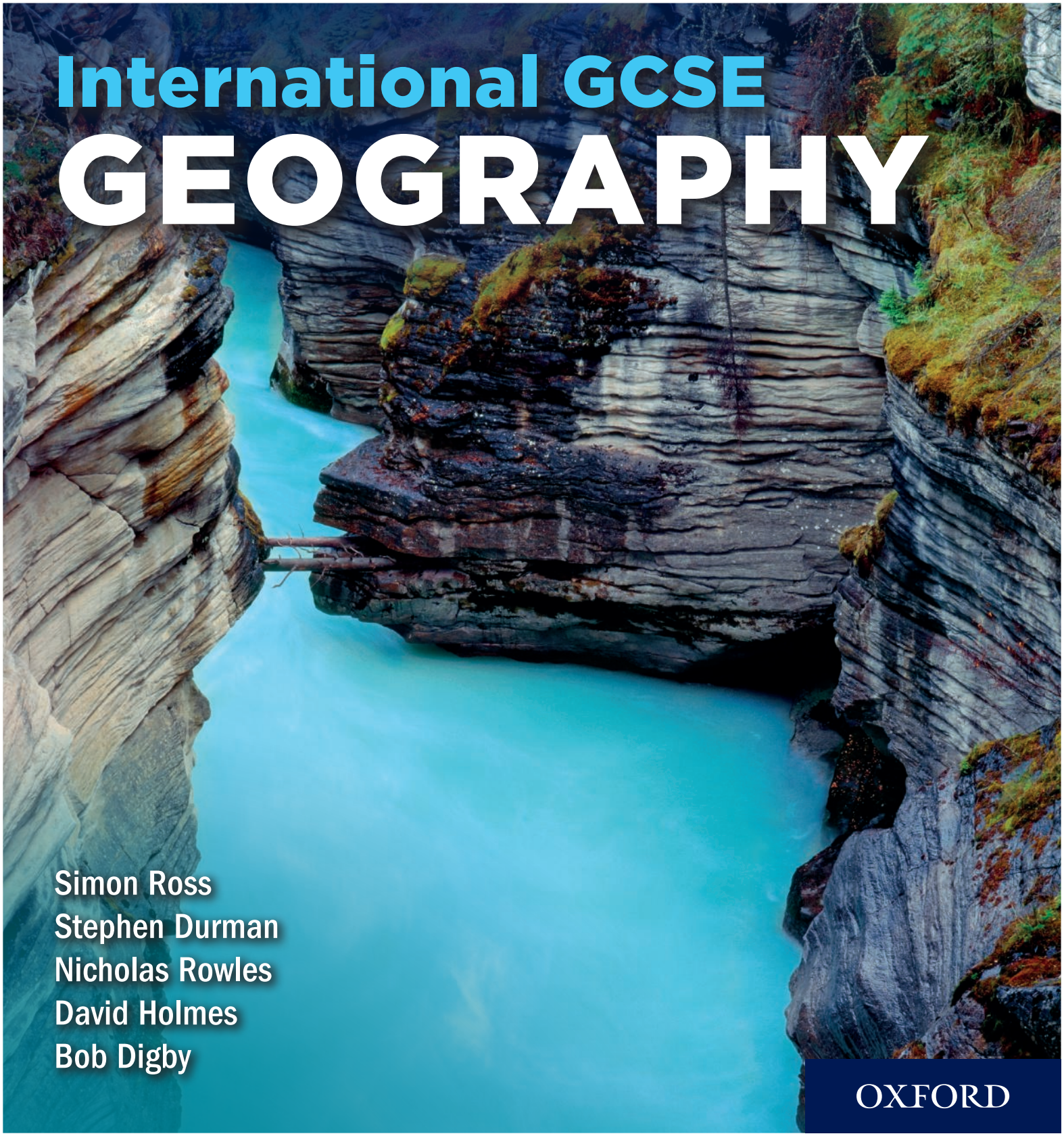

International GCSE
GEOGRAPHY

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OXFORD

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1 Natural hazards

1.1 What are natural hazards?

On this spread you will find out about the risks from natural hazards

What is a natural hazard?

In March 2015 landslides struck Bujumbura in western Burundi, central Africa, killing several people and leaving thousands homeless. Following a period of heavy rain, mud and rocks plunged down hillsides destroying houses and damaging roads (photo **A**).

This event is an example of a natural hazard. It is a natural event that has had a huge **social impact**. If the landslide had occurred in a remote area where it did not pose any threat to people it would not be considered a hazard.

Landslides are not major killers. The most deadly natural hazards are floods, storms, earthquakes and droughts. Between 2002 and 2012, an average of 100 000 people worldwide were killed each year by natural hazards. In most years, flooding caused the greatest number of deaths.

Diagram **B** is called a Venn diagram. Notice that a natural hazard occurs when a natural event overlaps with human activities.

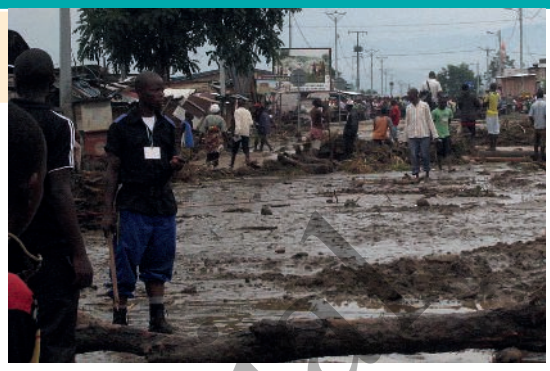
What are the different types of natural hazard?

There is a huge range of natural hazards. These include:

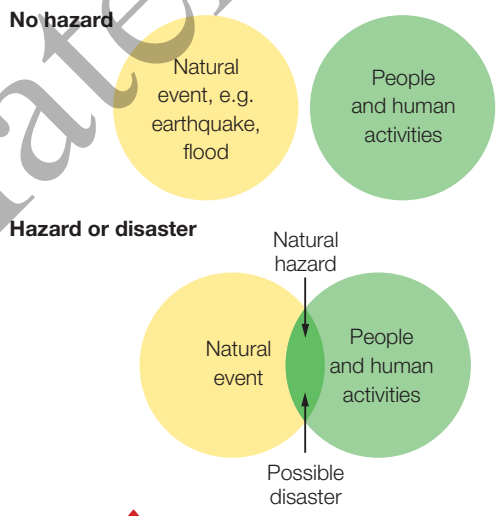
- volcanic eruptions
- earthquakes
- storms
- tsunami (huge waves caused by earthquakes)
- landslides
- floods.

Diagram **C** shows how natural hazards can be sorted into three main groups.

Did you know?
Hurricane Patricia (2015) was the most powerful tropical storm ever recorded, with winds reaching 320 km/h (200 mph).

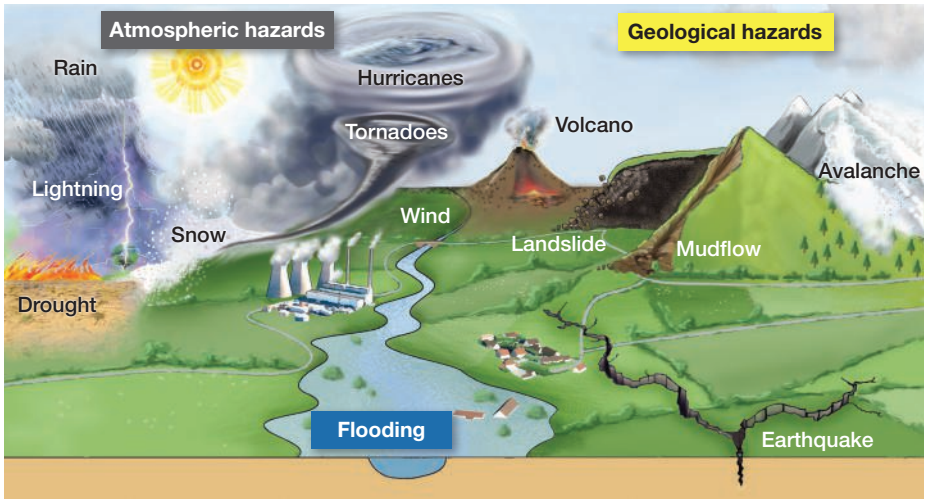


A *Landslides affecting Bujumbura, Burundi, 2015*



B *When is a natural event a hazard?*

C *Different types of natural hazard*



What is 'hazard risk'?

Hazard risk is the chance or probability of being affected by a natural event. People who choose to live close to a river may be at risk from flooding. Those who live close to the sea may be at risk from tropical cyclones or tsunami.

So why do people put themselves at risk by living in such places? They weigh up the advantages and disadvantages and, because such events don't happen very often, they may decide to accept the risk. Some people may have little choice of where to live or knowledge that where they are living is dangerous.

Think about it

*Are natural hazards occurring more frequently today than 100 years ago? Use diagram **B** to help you.*

What factors affect risk?

There are several factors that have led to an increase in the number of people at risk from natural events.

Factors increasing the risk from natural hazards

Poverty
In poorer parts of the world poverty may force people to live in areas at risk. This is especially true in cities such as Lima in Peru or Caracas in Venezuela. Here, a shortage of housing has led to people building on unstable slopes prone to floods and landslides.

Urbanisation
Over 50 per cent of the world's population now live in cities. Some of the world's largest cities (e.g. Tokyo, Istanbul and Los Angeles) are at risk from earthquakes.

Densely populated urban areas are at great risk from natural events such as earthquakes and tropical cyclones. The 2010 Haiti earthquake destroyed much of the capital Port-au-Prince killing some 230 000 people.

Farming
When a river floods it deposits fertile silt on its floodplain, which is excellent for farming. But when people choose to live there they are putting themselves at risk. In low-lying countries many people may live on floodplains, such as those of the River Ganges in Bangladesh.

Climate change
In a warmer world the atmosphere will have more energy leading to more intense storms and hurricanes. **Climate change** may cause some parts of the world to become wetter with an increased risk of flooding. Other areas may become drier and prone to droughts and famines.

ACTIVITIES

1 Describe what has happened in photo **A**.

2 **a** Make a copy of diagram **B**.

b Explain in your own words how a 'natural event' becomes a 'natural hazard'.

3 **a** What are the three main groups of hazard shown in diagram **C**?

b Why do you think more people are likely to be affected by river flooding than by landslides and mudflows?

4 In the future, why is it likely that increasing numbers of people will be at risk from natural hazards?

Stretch yourself

Find out about natural hazards in Bangladesh. What are the natural events that threaten the country? Why are so many people at risk from these events?

Maths skills

Use a divided bar chart or a pie chart to present the following information.

Percentage of fatalities (2014)

Hydrological events (e.g. floods)	66%
Meteorological events (e.g. storms)	17%
Geophysical events (e.g. earthquakes)	11%
Climatological events (e.g. drought)	6%

Practice question

Explain two human developments that would increase the risk of people being affected by natural hazards. *(4 marks)*

2 Tectonic hazards

2.1 Distribution of earthquakes and volcanoes

On this spread you will find out where earthquakes and volcanoes happen and link their location to plate tectonics

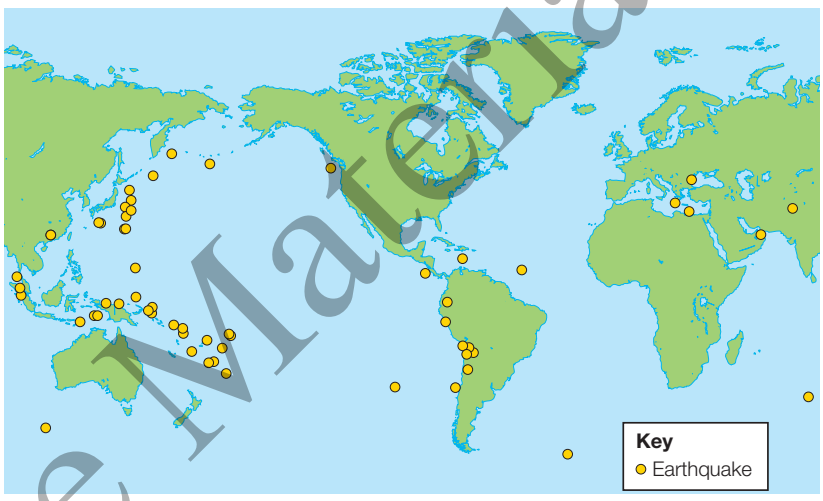
Why is there a pattern of earthquakes?

An **earthquake** is a sudden and violent period of ground shaking. It is most commonly caused by a sudden movement of rocks within the Earth's crust. This occurs mainly at the margins of *tectonic plates* (map **B**) where plates are moving and enormous pressures build up and are released.

Compare map **B** to map **A**. Notice the pattern of earthquakes along **plate margins**, for example along the western coast of North and South America. The occurrence of earthquakes around the edge of the Pacific Ocean follows the plate margins.

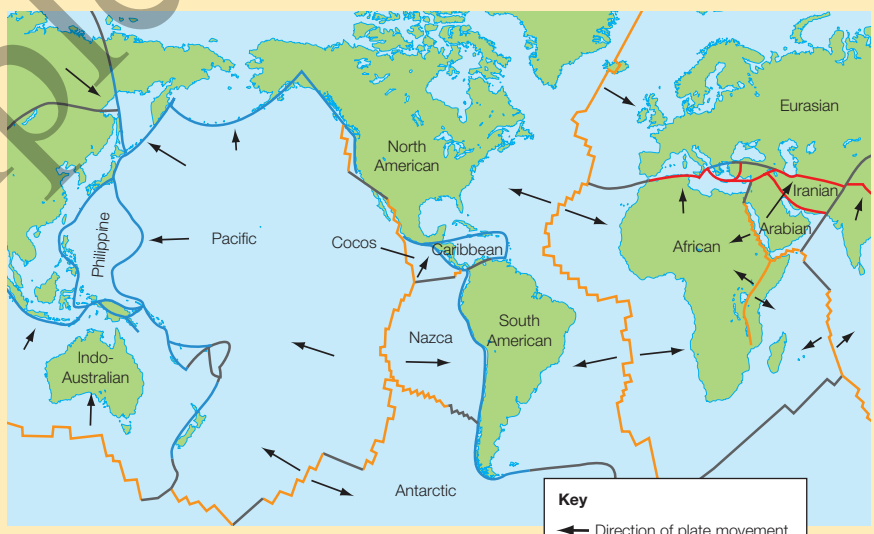
Some earthquakes do not occur at plate margins. These may be caused by human activity such as underground mining or oil extraction.

A *Earthquakes recorded during March 2015*

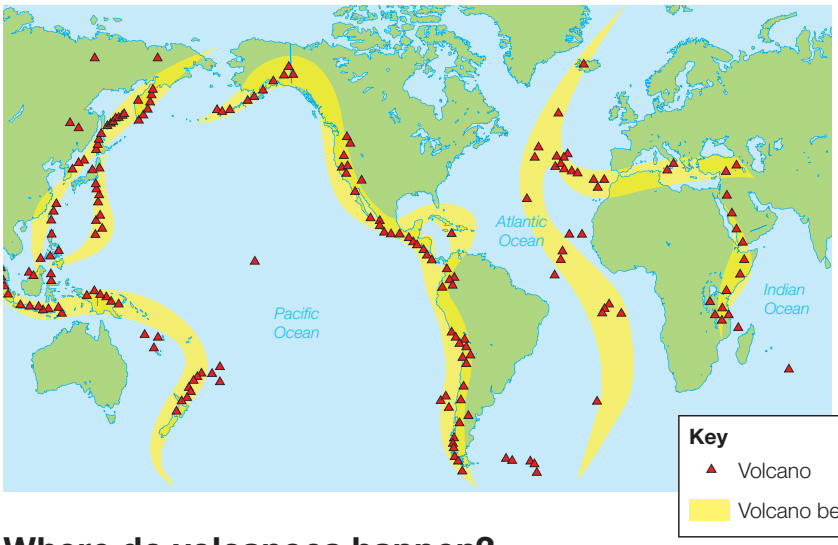


Tectonic plates

- The Earth's crust is split into a number of plates about 100 km thick.
- There are two types of crust – dense, thin oceanic crust and less dense, thick continental crust.
- Plates move in relation to each other due to convection (heat) currents from deep within the Earth. Gravitational pull may play a part.
- At a *constructive* plate margin plates move apart. New crust is formed as magma rises towards the surface. At a *destructive* margin, where plates are moving towards each other, the denser oceanic plate may sink (subduct) beneath a less dense continental plate. Gravity pulls the oceanic plate into the mantle, dragging the plate away from the constructive margin.
- Tectonic activity at plate margins causes earthquakes and volcanoes.



B *The Earth's tectonic plates*



C The distribution of volcanoes

Think about it

Think about any major earthquakes or volcanoes that have been in the news recently. How does their location link to plate tectonics?

Where do volcanoes happen?

Look at map **C**, which shows the distribution of volcanoes. A **volcano** is a large and often conical-shaped landform usually formed over a long period of time by a series of eruptions. Like earthquakes, the majority of volcanoes occur in long belts that follow the plate margins, for example around the edge of the Pacific Ocean. This is known as the 'Pacific Ring of Fire'. There is also a belt of volcanoes through the middle of the Atlantic Ocean. This is the Mid-Atlantic Ridge which includes the Azores and Iceland, which are volcanic islands.

Why is there a pattern of volcanoes?

Volcanoes are fed by hot molten rock (magma) from deep within the Earth. This rises to the surface at *constructive* and *destructive* plate margins. Volcanoes also form at hot spots, where the crust is thin and magma is able to break through to the surface. The Hawaiian Islands in the Pacific Ocean are a good example of a hot spot.

Did you know?

The biggest volcanic eruption ever recorded was Mount Tambora, in Indonesia, in 1815. Volcanic ash from the eruption blocked the sun!

ACTIVITIES

1 Use map **A** to describe the pattern of earthquakes.
2 Use map **B** to answer the following questions.
   a Which plate is the UK on?
   b Name a country which is being split by two plates.
   c Describe the movement of the plates at the margin of the Nazca and South American plates.
3 Describe the pattern of volcanoes (map **C**). Refer to names of oceans, continents and countries in your answer.
4 Why do the majority of earthquakes and volcanoes occur at plate margins?

Stretch yourself

Use the United States Geological Survey (USGS) website to find a map of recent earthquakes. You could look at a single day or a whole week. Copy and paste the map and write a few sentences (or use text boxes) to describe the pattern of earthquakes. Use map **B** to relate this to named plate margins.

Maths skills

A total of 1482 earthquakes occurred in a seven-day period at the end of April 2016. Work out the average number of earthquakes per day and per hour. Can you calculate the frequency of the earthquakes?

Practice question

Explain why the majority of earthquakes and volcanoes occur at plate margins. *(4 marks)*

2.2 Physical processes at plate margins

On this spread you will find out about the physical processes at plate margins

What happens at plate margins?

Iceland is a country in the North Atlantic Ocean. It is situated on the Mid-Atlantic Ridge, a plate margin where two plates are moving away from each other. There are several active volcanoes in Iceland including Eyjafjallajökull, which erupted in 2010 (photo **A**). It is possible to identify three main types of plate margin:

- **Constructive** – where two plates are moving apart.
- **Destructive** – where two plates are moving towards one another.
- **Conservative (transform)** – where two plates are sliding alongside each other.

A *Eruption of Eyjafjallajökull, 2010*

Maths skills

At a constructive plate margin, each plate moves at an average of 2 cm a year. Calculate the increase in the width of Iceland over a period of 1 million years.

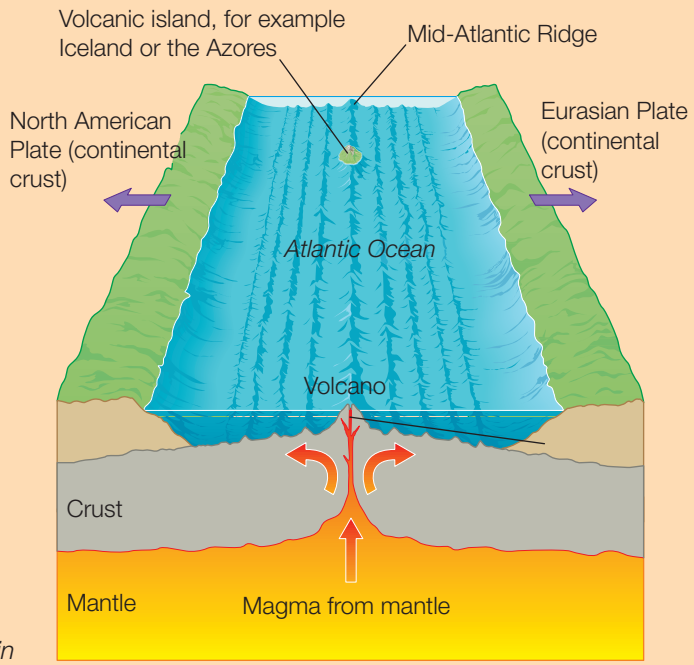
Did you know?

Volcanic eruptions over millions of years mean that Iceland is growing outwards from the middle!

Constructive margin

At a constructive margin two plates are moving apart. Diagram **B** shows what is happening at the constructive margin in the mid-Atlantic. Magma is forcing its way to the surface along the Mid-Atlantic Ridge. As it breaks through the overlying crust it causes earthquakes. On reaching the surface it forms volcanoes such as Eyjafjallajökull in Iceland.

The magma at constructive margins is very hot and fluid. Lava erupting from a volcano will flow a long way before cooling. This results in typically broad and flat *shield volcanoes*.



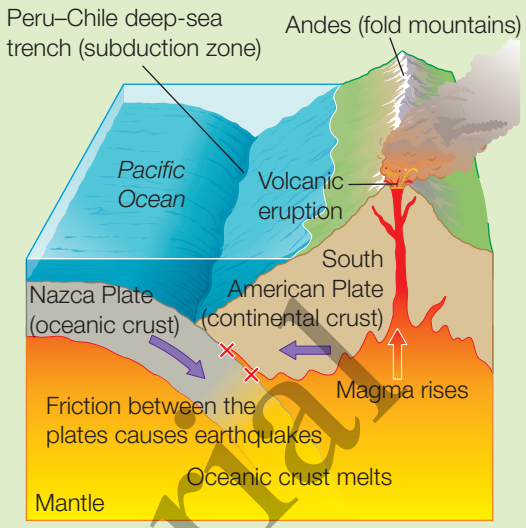
B *Constructive plate margin*

Destructive margin

At a destructive plate margin two plates are moving towards one another. Diagram **C** shows what is happening on the west coast of South America.

Where the two plates meet a deep ocean trench has formed. The oceanic Nazca Plate, which is relatively dense, is *subducted* beneath the less dense South American Plate. Friction between the two plates causes strong earthquakes. As the oceanic plate moves downwards it melts. This creates magma which is less fluid than at a constructive margin. It breaks through to the surface to form steep-sided *composite volcanoes*. Eruptions are often very violent and explosive.

Where two continental plates meet, there is no subduction. Instead, the two plates collide and the crust becomes crumpled and uplifted. This collision forms fold mountains such as the Himalayas. These mountain-building processes cause earthquakes. There are no volcanoes at these *collision* margins because there is no magma.



C *Destructive plate margin*

Conservative margin

At conservative plate margins, two plates are moving past each other. Friction between the plates then causes earthquakes. Map **D** shows the San Andreas Fault in California, a well-known example of a conservative margin. The faster-moving Pacific Plate is sliding in the same direction next to the slower-moving North American Plate.

Earthquakes happen along conservative margins as stresses gradually build up over many years. They can be destructive as they are close to the Earth's surface. These are released suddenly when the plates slip and shift.

There are no volcanoes because there is no magma.

D *Conservative plate margin*

ACTIVITIES

1 **a** What type of plate margin runs through the middle of Iceland?
   b Why do earthquakes occur in Iceland?
   c Explain why there are volcanoes like Eyjafjallajökull in Iceland.
2 Explain the formation of earthquakes and volcanoes at a destructive margin (diagram **C**).
3 Make a copy of map **D**.
   a Use crosses to show where you would expect earthquakes to happen.
   b Why are there no volcanoes at a conservative plate margin?

Stretch yourself

Find out about the North Anatolian Fault, one of the world's most active plate margins.

- Where is it?
- What type of plate margin is it?
- What are the hazards associated with the North Anatolian Fault?
- Which major city near this fault is at greatest risk from a natural disaster?

Practice question

Explain the physical processes that happen at constructive plate margins. *(4 marks)*