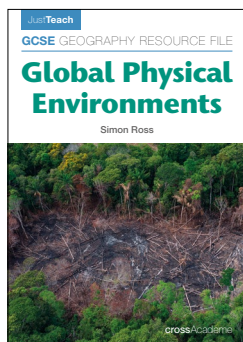


Global Physical Environments

Simon Ross





Global Physical Environments

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Natural hazards and risk

There is a huge range of **natural hazards** including floods, earthquakes, volcanic eruptions, wildfires (Figure 1) and landslides. In remote regions, these natural events pose no direct risk to people or human activity.

Risk is the chance or probability of being affected by a natural hazardous event. Increasing numbers of people are now at risk from natural hazards due to population growth, urbanisation, resource extraction and climate change.

A **disaster** may occur when human settlement and infrastructure, such as buildings and roads, exist in the path of the forces of nature. The effects may include significant loss of life, physical damage, economic disruption and social impacts that may last for many years.

Figure 1 Wildfire in southern California, 2017



CROWDSPARK/ALAMY STOCK PHOTO

Activities

1 Study Figure 1.

(a) What natural hazard is shown?

(1 mark)

(b) Do you think the buildings in the photograph are at risk? Explain your answer.

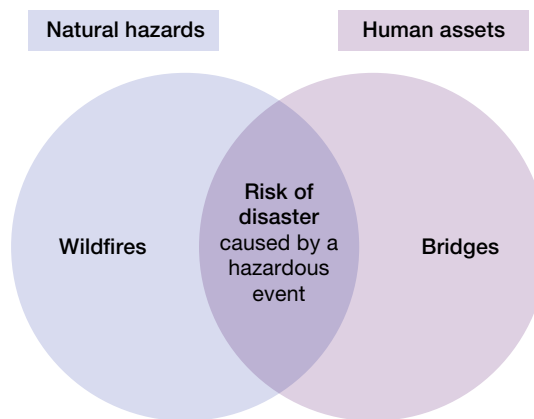
(2 marks)

(c) How could the level of risk be reduced?

(2 marks)

- 2 Figure 2 is a Venn diagram. You have probably come across this diagram in other subjects. It is used to show interrelationships, connections or outcomes between two or more sets of data. Complete the diagram by writing examples of natural hazards and human assets (structures, buildings, human activity). Two examples have been written for you. (2 x 2 marks)

Figure 2 A Venn diagram showing the risks associated with natural hazards



- 3 Look at Figure 3. The graphics are used to illustrate risks associated with natural hazards. Devise a graphic of your own inspired by these examples to illustrate the risks associated with one or more natural hazards. (4 marks)

Figure 3 Graphics illustrating the risks associated with natural hazards



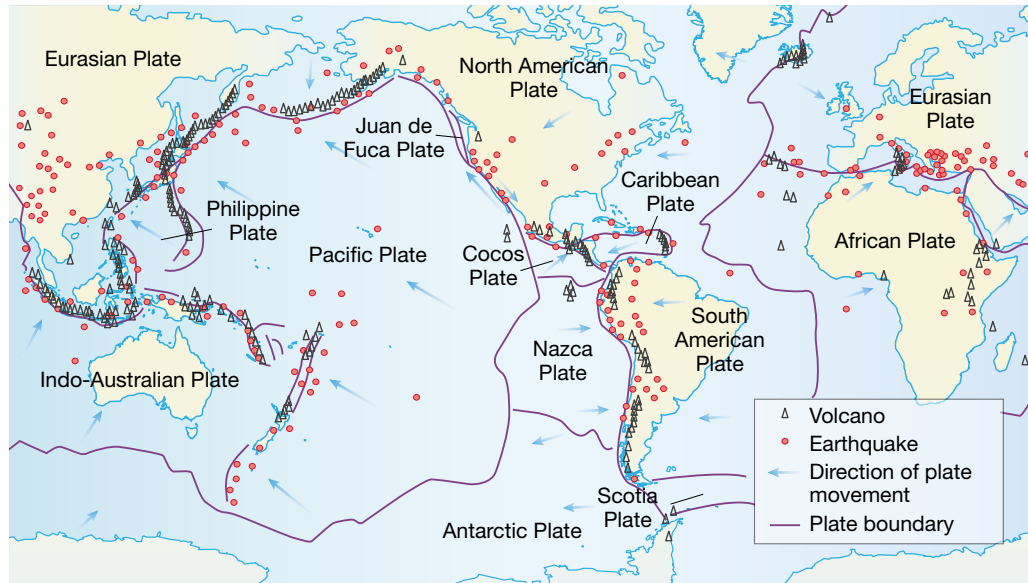
Online activity

Access the Earth Observatory website at [https://earthobservatory.nasa.gov/Natural Hazards/](https://earthobservatory.nasa.gov/NaturalHazards/). It shows a map of recent natural hazard events which have impacted on people, such as floods and earthquakes. Select one event that interests you and compile a short PowerPoint presentation with a maximum of six slides. (These presentations could be shared with the rest of the class.)

The distribution of earthquakes and volcanoes

Figure 1 is a map showing the global pattern of earthquakes and volcanoes. It also shows the major plate margins and their directions of movement. Look at the key to understand the symbols used to show the various features.

Figure 1 The global distribution of volcanoes, earthquakes and plate margins



Activity

1 Study Figure 1.

(a) Describe the pattern of volcanoes in South America. (2 marks)

(b) Which two plates are responsible for the earthquakes and volcanoes on the western side of South America? (1 mark)

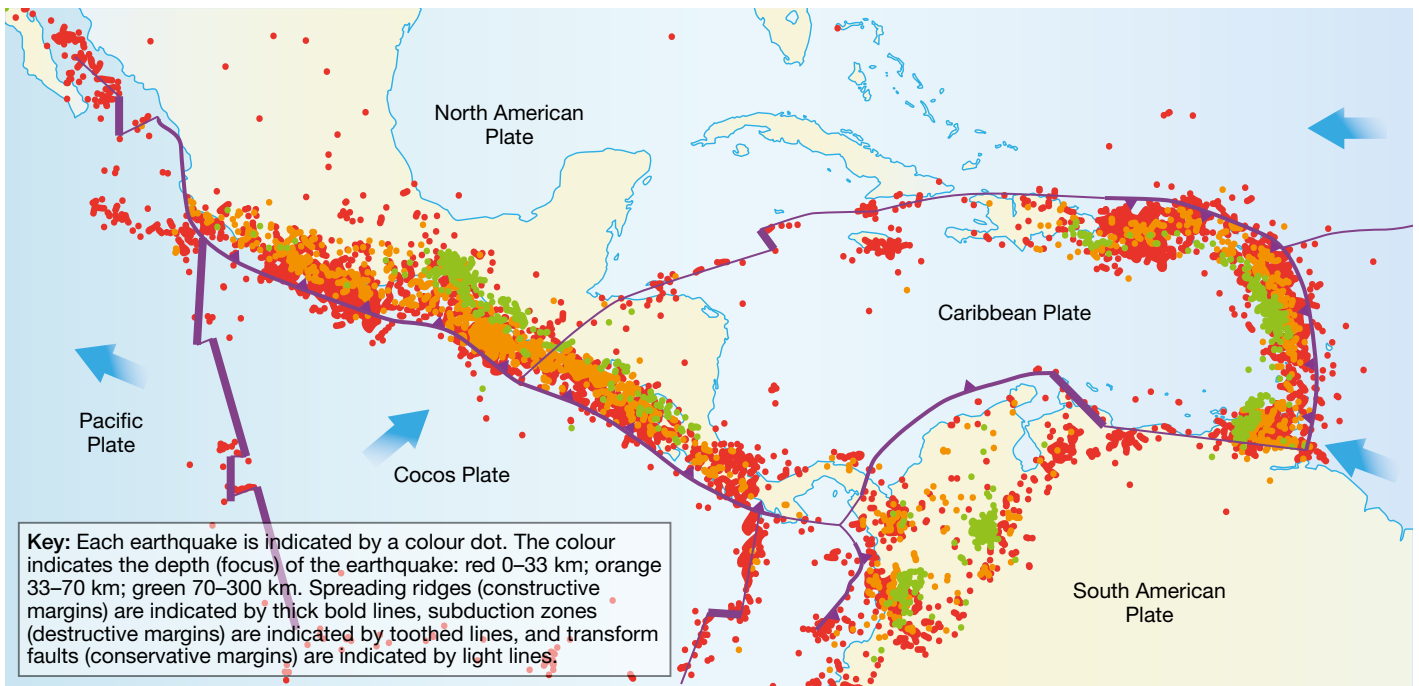
(c) On Figure 1, locate and label the Pacific 'Ring of Fire'. (2 marks)

(d) Describe the pattern of earthquakes in North America. (2 marks)

(e) Suggest why there are no volcanoes or earthquakes in Australia. (2 marks)

Figure 2 The distribution of earthquakes in Central America

Figure 2 is a detailed seismic map of Central America and the Caribbean showing earthquakes and the major plate margins. This is an extremely active tectonic region that experiences frequent powerful earthquakes and occasional violent volcanic eruptions. It is part of the much larger Pacific 'Ring of Fire'.



Activities

2 Study Figure 2.

(a) Locate and label the following countries: Mexico, Cuba and Venezuela. (3 marks)

(b) Describe the directions of movement of the Pacific Plate and the Cocos Plate at the spreading ridge (constructive) plate margin. (2 marks)

UNIT
2

The distribution of earthquakes and volcanoes

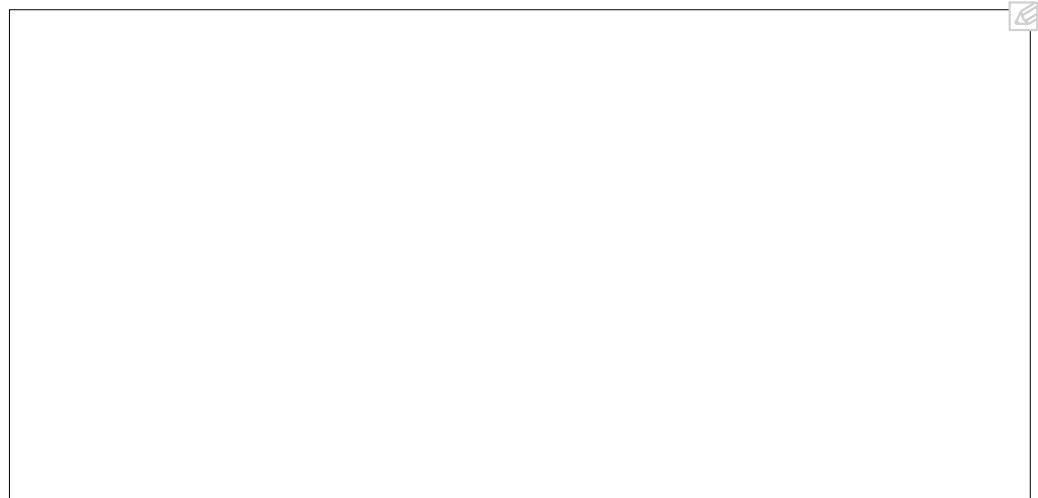
3 Study the earthquakes at the eastern margin of the Caribbean Plate where it meets the South American Plate.

(a) What type of plate margin is it? (1 mark)

(b) What is happening at this plate margin? (2 marks)

(c) Describe the pattern of earthquakes at this margin. (2 marks)

(d) Use the earthquake depths to draw a simple cross section through this plate margin. Show the earthquakes and label the two plate margins. (4 marks)



Online activity

Use an atlas or the internet to locate and label the following volcanoes on Figure 2: Paricutin, Popocatepetl, Cotopaxi and Montserrat. On what type of plate margin are these volcanoes located?

Processes at plate margins

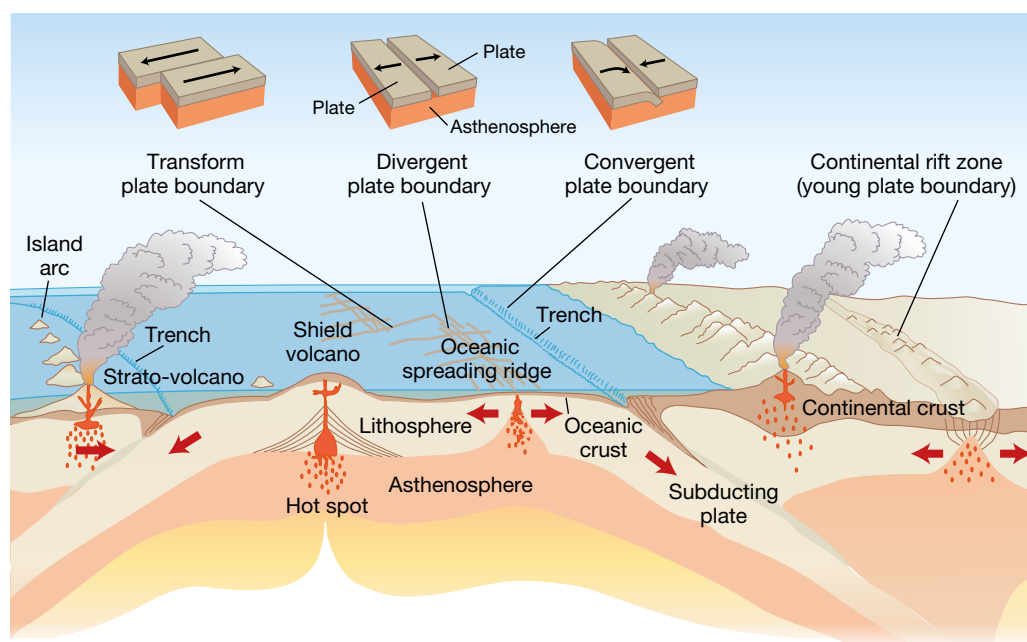
Types of plate margin

- **Constructive (divergent) margin** – where two plates are moving away from each other. Magma rises to the surface, fracturing rocks to form earthquakes and erupting at the surface to form volcanoes.
- **Destructive (convergent) margin** – where two plates are moving towards one another. The denser plate will dive (subduct) beneath the other plate, building up immense pressures that will periodically be released as earthquakes. Melting of the plate at depth creates magma that rises to the surface to form volcanoes, often involving explosive eruptions.
- **Conservative (transform) margin** – where two plates are slipping alongside each other. Immense pressures often result in powerful earthquakes. No magma is produced at this margin, so there will be no volcanoes.

Figure 1 shows the location of the three types of plate margin. Notice that the Earth has three distinct outer layers:

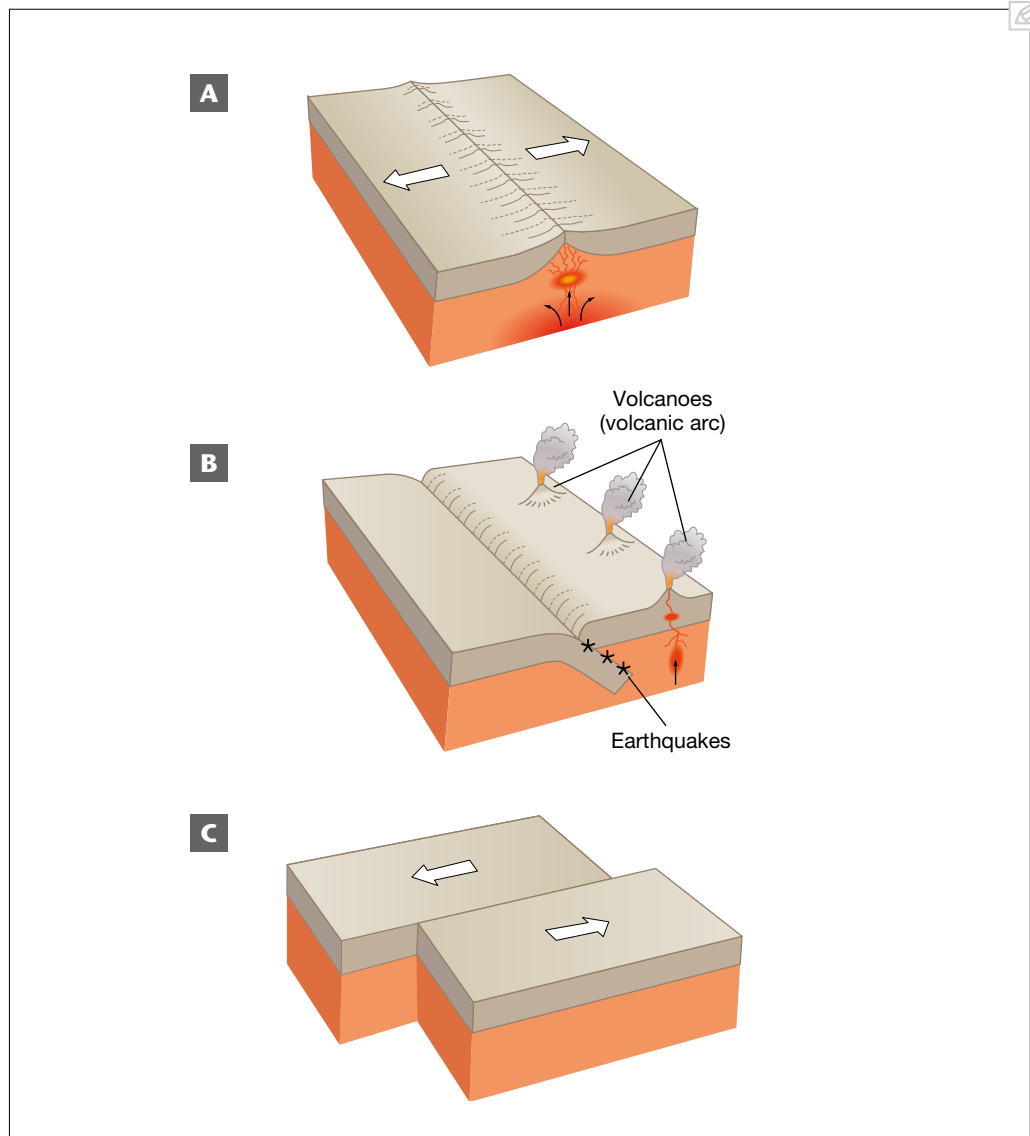
- **Crust** – the oceanic crust is relatively thin but dense, whereas the continental crust is thicker and less dense.
- **Lithosphere** – incorporating the crust, this is the solid outer layer of the Earth that forms the ‘plates’. It is approximately 100 km thick.
- **Asthenosphere** – this partially liquid, ‘plastic’ layer enables the solid lithosphere above to move around.

Figure 1 Cross section through the Earth to show tectonic activity and landforms



The mechanisms involved in plate movement are highly complex. Convection currents generated deep within the Earth are important driving forces along with the effect of gravity, which effectively 'pulls' the plates downwards from the oceanic ridge and into the subduction zone.

Figure 2 Processes and landforms at plate margins



Activity

1 Study Figure 2, which shows simplified diagrams of the three types of plate margin.

- Write the correct name of the plate margin above each diagram. *(3 x 1 marks)*
- On Diagram A, locate and label the following: lithosphere, asthenosphere, rising magma and ocean ridge. Indicate where you would expect to find a volcano and where earthquakes might occur. *(6 x 1 marks)*
- On Diagram B, draw arrows to indicate the direction of plate movement and label the ocean trench. *(2 x 1 marks)*

(d) On Diagram C, show how earthquakes occur close to the surface along the line of the plate margin. *(1 mark)*

(e) Explain why there are no volcanoes at conservative (transform) margins. *(2 marks)*

(f) Explain the formation of earthquakes and volcanoes at the destructive margin shown in Figure 2. *(4 marks)*

Online activity

There are several interesting landforms in Figure 1 that are worth investigating further using the internet. Choose *one* of the following:

- East African rift valley (example of a continental rift zone);
- Tonga volcanic arc;
- Hawaii 'hot spot'.

For your chosen tectonic landform, describe its characteristics and formation using diagrams and photographs to support your answer.