

Through the Window KS4 Earth Science - plate tectonics through my window? Teacher sheet

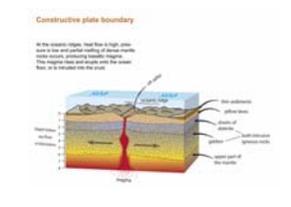
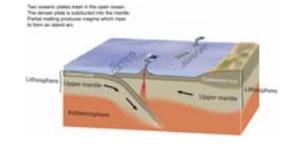
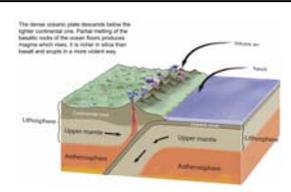
If this was an active plate margin:

Some possible answers are given below.

| .. how might the view change if .. | Assume .. | Changes I might see .. |
|--|--|---|
| .. a big earthquake struck the area - like those where plates collide at a destructive plate margin (eg. Pakistan or Turkey) or where plates slide past each other (eg. San Francisco) | .. the earthquake is big enough to destroy some of the buildings but not all of them | <ul style="list-style-type: none"> • The ground moving up and down in waves • Multi-storey buildings collapsing • The glass from damaged multi-storey buildings raining down • Low buildings shaking but surviving • Timber buildings like sheds flexing and surviving |
| .. a tsunami struck the area - like those sometimes triggered at destructive plate margins (eg. south east Asia/Indonesia) | .. the tsunami comes from the left | <ul style="list-style-type: none"> • A wave washing in from the left, followed by more waves |
| .. a violent volcanic eruption happened nearby, with a huge volcanic blast in this direction - like those that erupt at destructive plate margins (eg. Mt. St. Helens, Krakatoa) | .. the blast comes from the left | <p>This would probably happen so fast that you couldn't comprehend what is happening, but you might see:</p> <ul style="list-style-type: none"> • Buildings being destroyed • Debris flying from left to right • Cars and people being blasted away • A mudflow (lahar) might follow |
| .. a violent volcanic eruption happened nearby blasting out bombs and thick ash deposits - like those that erupt at destructive plate margins (eg. Pinatubo, Philippines) | .. the volcano is to the left and the wind is blowing your way | <p>You would probably see nothing, as it would be completely black - like the darkest night. If you could see, the surroundings would be dull grey with:</p> <ul style="list-style-type: none"> • Ash raining down like snow • Buildings covered in a thick blanket of ash • Roofs collapsing under the weight of ash • Volcanic bombs making small craters |
| .. a big landslide struck the area - like those triggered by earthquakes at destructive plate margins (eg. Pakistan, Nepal) | .. the landslide comes from the left | <ul style="list-style-type: none"> • Buildings and everything in its path being swept away • A layer of broken rock, soil, rubble with some broken buildings and half buried cars and belongings |
| .. a volcanic eruption producing runny basalt lava happened - like those that erupt where new plate is being formed, at constructive plate margins (eg. Iceland) or at volcanic hot spots (eg. Hawaii) | .. the volcano is to the left | <ul style="list-style-type: none"> • Red hot lava flowing like a river or cooling black lava flowing slowly in from the left • Anything inflammable and caught by the lava catching fire • Later - a black undulating sheet of solid lava with a ropy or blocky surface stretching into the distance |
| Later - for all of these: | | <ul style="list-style-type: none"> • The emergency services in action • Collapsed or buried homes being excavated by ordinary people • The homeless living in tents and makeshift shelters • Aid being delivered (food, water, medical) |

KS4 Earth Science through the Window - plate tectonics through another window (1) Teacher sheet

What views might you see through a window or porthole at an active plate margin. What other differences might your senses detect? Some possible answers are given below

| Active plate tectonic area | | | If you were there - what might you be able to see through the window or porthole? | What might your other senses detect? (hearing, feeling, smelling, tasting) |
|---|--|---|--|--|
| Area | Description | Diagram | | |
| A constructive plate margin in an oceanic area | Here is an oceanic ridge where currents in the mantle beneath rise and carry oceanic plates apart, allowing magma to rise in between to form new plate material. A rift valley in the centre has earthquakes (eg. the Atlantic Ocean on and near Iceland). |  <p>Constructive plate boundary <small>As the plates slide apart, magma rises from the mantle to form new oceanic crust. The magma rises through a rift valley in the centre of the plates. The magma then solidifies to form new oceanic crust. The magma then solidifies to form new oceanic crust.</small></p> | Unless you were on an island like Iceland, you could see only sea through the porthole. If you descended in a bathysphere, you might be able to see volcanic activity and hydrothermal vents on the sea floor. On Iceland, you might see a volcanic eruption producing lava in flows and fire fountains and ash - spectacular but fairly safe | If you were on Iceland, you could feel earthquakes and volcanic eruptions from time to time and smell the gases from hydrothermal vents - otherwise, all you could hear and taste would be the sea going up and down - making you seasick! |
| A destructive plate margin in an oceanic area | In this oceanic area, one plate is subducted beneath another at a trench, causing earthquakes. Molten magma from the subducting plate rises to form explosive volcanoes in a row of islands (eg. Japan and the West Indies). |  <p><small>The oceanic plate slides under the other oceanic plate. The magma rises from the mantle to form new oceanic crust. The magma then solidifies to form new oceanic crust.</small></p> | On a temperate volcanic island the view might be very similar to the one from your own window. A tropical or arctic island would have typical vegetation and buildings. You might see the sea in the distance. Above a trench, you would see only sea, with maybe a conical volcanic island in the distance. | On a volcanic island you might sense violent volcanic eruptions and earthquakes. Out at sea above a trench, all you could probably sense would be the sea. |
| A destructive plate margin on a continent near an ocean | Here an oceanic plate is subducted under a continental plate at a trench causing earthquakes. A mountain chain is formed on the continent with explosive volcanoes caused by rising magma from the subducting plate (eg. the west coast of South America). |  <p><small>The oceanic plate slides under the continental plate. The magma rises from the mantle to form new oceanic crust. The magma then solidifies to form new oceanic crust.</small></p> | This mountain chain would probably be very rugged with high altitude vegetation and some volcanic peaks. Earthquake damage might be common and earthquake-proof buildings might be present in more developed countries. | You could sense earthquakes from time to time and, if unlucky, might feel the effects of a tsunami. Volcanic activity might cause smells and vibrations. |

KS4 Earth Science through the Window - plate tectonics through another window (2) Teacher sheet

| Active plate tectonic area | | | If you were there - what might you be able to see through the window or porthole? | What might your other senses detect? (hearing, feeling, smelling, tasting) |
|---|---|---------|---|--|
| Area | Description | Diagram | | |
| A destructive plate margin between two continents | Two plates carrying continents have collided here forming a great chain of mountains affected by earthquakes (eg. the Himalayan Mountains where India has collided with Asia). | | In this high rugged mountain chain, only high altitude plant species can grow. The effects of earthquakes and landslides might be seen. Monsoonal rain and snow might be common and glaciers might be visible. | At these high altitudes, it would be difficult to breathe and to walk far until you were acclimatised. You might sense the effects of earthquakes and landslides. |
| A sliding plate margin area | Here, plates slide past each other, but become stuck, causing violent earthquakes. This happens beneath the sea and at the San Andreas fault in California, USA. | | If you were on land and unlucky, you might see an earthquake, with waves affecting the land surface destroying the buildings around you. You might see a steep slope forming a line across the country (a fault scarp) and straight lines crossing the fault (eg. rivers, lines of trees in orchards, fences, railway rails) might be offset. | If you were on land, you might be able to sense the effects of an earthquake or a tsunami triggered by an earthquake. |
| A constructive plate margin within a continent | As currents in the mantle beneath rise and move apart, they carry the plate above with them, causing a long rift valley with faults. Magma from the mantle below causes volcanoes that are fairly safe and hydrothermal areas (eg. the East African Rift Valley). | | You might see long a steep-sided valley with a flat bottom, often containing a long lake. The steep sides are fault scarps. There maybe volcanic peaks nearby with many sheets of lava. There may also be hydrothermal areas (geysers, etc.). | You might sense the volcanic eruptions, the hydrothermal areas and the earthquakes caused when the central part of the valley slips downwards along the faulted edges. |
| A volcanic 'hot spot' | Magma rises through the upper mantle in a plume that "burns" through the plate above producing volcanoes. As the plate above moves, the plume stays in the same place, forming a line of volcanoes like those of the Hawaiian chain. | | You might see the volcano erupting and you could go and have a close look because it is relatively safe - with a steaming crater, lava flows, lava fountains and hydrothermal areas. | The volcanic and hydrothermal activity would produce smelly volcanic gases and you might be able to sense the heat and vibrations caused by volcanic eruption. |

Extension work: Although the UK is no longer on a plate margin, it has been in the past. So you could ask what sort of ancient plate margin is shown by: a) the volcanic ash and bomb deposits of the Lake District/North Wales (destructive margin); b) the many layers of basalt lava found in Antrim, Northern Ireland (constructive margin within a continent); c) the roots of the mountain chain (folded rocks with granites) that forms the Southern Uplands in Scotland, with Scotland to the north and England to the south (destructive plate margin between two continents).

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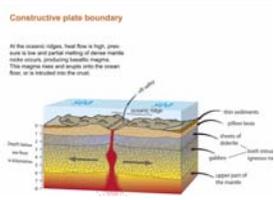
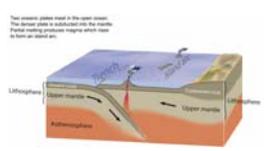
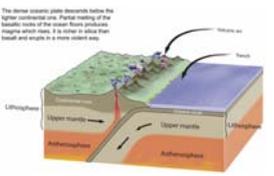
The view through your window is very different from the view you would get from a window at an active plate margin. This is because we are near the centre of one of the Earth's plates, and the active margins are thousands of kilometres away.

But if this was an active plate margin ..

| .. how might the view change if .. | Assume .. | Changes I might see .. |
|--|--|------------------------|
| .. a big earthquake struck the area - like those where plates collide at a destructive plate margin (eg. Pakistan or Turkey) or where plates slide past each other (eg. San Francisco) | .. the earthquake is big enough to destroy some of the buildings but not all of them | |
| .. a tsunami struck the area - like those sometimes triggered at destructive plate margins (eg. south east Asia/Indonesia) | .. the tsunami wave comes from the left | |
| .. a violent volcanic eruption happened nearby, with a huge volcanic blast in this direction - like those that erupt at destructive plate margins (eg. Mt. St. Helens, Krakatoa) | .. the blast comes from the left | |
| .. a violent volcanic eruption happened nearby blasting out bombs and thick ash deposits - like those that erupt at destructive plate margins (eg. Vesuvius/Pompeii) | .. the volcano is to the left and the wind is blowing your way | |
| .. a big landslide struck the area - like those triggered by earthquakes at destructive plate margins (eg. Pakistan, Nepal) | .. the landslide comes from the left | |
| .. a volcanic eruption producing runny basalt lava happened - like those that erupt where new plate is being formed, at constructive plate margins (eg. Iceland) or at volcanic hot spots (eg. Hawaii) | .. the volcano is to the left | |

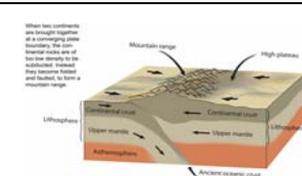
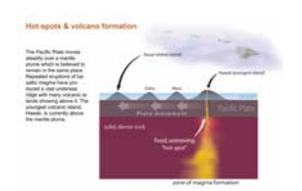
KS4 Earth Science through the Window - plate tectonics through another window (1)

What views might you see through a window or porthole at an active plate margin? What other differences might your senses detect?

| Active plate tectonic area | | | If you were there - what might you be able to see through the window or porthole? | What might your other senses detect? (hearing, feeling, smelling, tasting) |
|---|---|---|---|--|
| Area | Description | Diagram | | |
| A constructive plate margin in an oceanic area | Here is an oceanic ridge where currents in the mantle beneath rise and carry oceanic plates apart, allowing magma to rise up in between to form new plate material. A rift valley in the centre has earthquakes (eg. the Atlantic Ocean on and near Iceland). | <p>Constructive plate boundary</p> <p>All the oceanic ridges have flow to high, low, rise to the east and parting meeting of oceanic plates with equally contrasting tectonic margins. Hot magma rises and spreads into the ocean floor, or is returned into the crust.</p>  | | |
| A destructive plate margin in an oceanic area | In this oceanic area, one plate is subducted beneath another at a trench, causing earthquakes. Molten magma from the subducting plate rises to form explosive volcanoes in a row of islands (eg. Japan and the West Indies) | <p>The oceanic plates meet at the ocean trench. The heavier plate is subducted into the mantle. Hot molten magma rises from the mantle to form an island arc.</p>  | | |
| A destructive plate margin on a continent near an ocean | Here an oceanic plate is subducted under a continental plate at a trench causing earthquakes. A mountain chain is formed on the continent with explosive volcanoes caused by rising magma from the subducting plate (eg. the west coast of South America). | <p>The oceanic plate subducts beneath the lighter continental one. Partial melting of the heavier rock of the ocean floor produces magma which rises. It is cooler in places than below and spreads in a more solid state.</p>  | | |

KS4 Earth Science through the Window - plate tectonics through another window (2)

What views might you see through a window or porthole at an active plate margin? What other differences might your senses detect?

| Active plate tectonic area | | | If you were there - what might you be able to see through the window or porthole? | What might your other senses detect? (hearing, feeling, smelling, tasting) |
|---|--|---|---|--|
| Area | Description | Diagram | | |
| A destructive plate margin between two continents | Two plates carrying continents have collided here forming a great chain of mountains affected by earthquakes (eg. the Himalayan Mountains where India has collided with Asia). | <p>When two continents are brought together at a converging plate boundary, the crustal material under one of the plates is forced under the other. The plates become folded and broken, so form a mountain range.</p>  | | |
| A sliding plate margin area | Here, plates slide past each other, but become stuck, causing violent earthquakes. This happens beneath the sea and at the San Andreas fault in California, USA. | <p>Transform faults</p> <p>Faults with a lateral slip of crustal material across the convergent plate. The compression for ground on either side of the fault boundary is a force across the convergent Earth.</p>  | | |
| A constructive plate margin within a continent | As currents in the mantle beneath, rise and move apart, they carry the plate above with them, causing a long rift valley with faults. Magma from the mantle below causes volcanoes that are fairly safe and hydrothermal areas (eg. the East African Rift Valley). | | | |
| A volcanic 'hot spot' | Magma rises through the upper mantle in a plume that "burns" through the plate above producing volcanoes. As the plate above moves, the plume stays in the same place, forming a line of volcanoes like those of the Hawaiian chain. | <p>Hot-spots & volcano formation</p> <p>The Pacific Plate moves generally westward, and a mantle plume stays in the same place. As the plate moves, the plume creates a series of volcanoes. The oldest volcano is the one that has moved farthest from the plume, and the youngest is the one that is currently over the plume. The plume is a hot spot.</p>  | | |