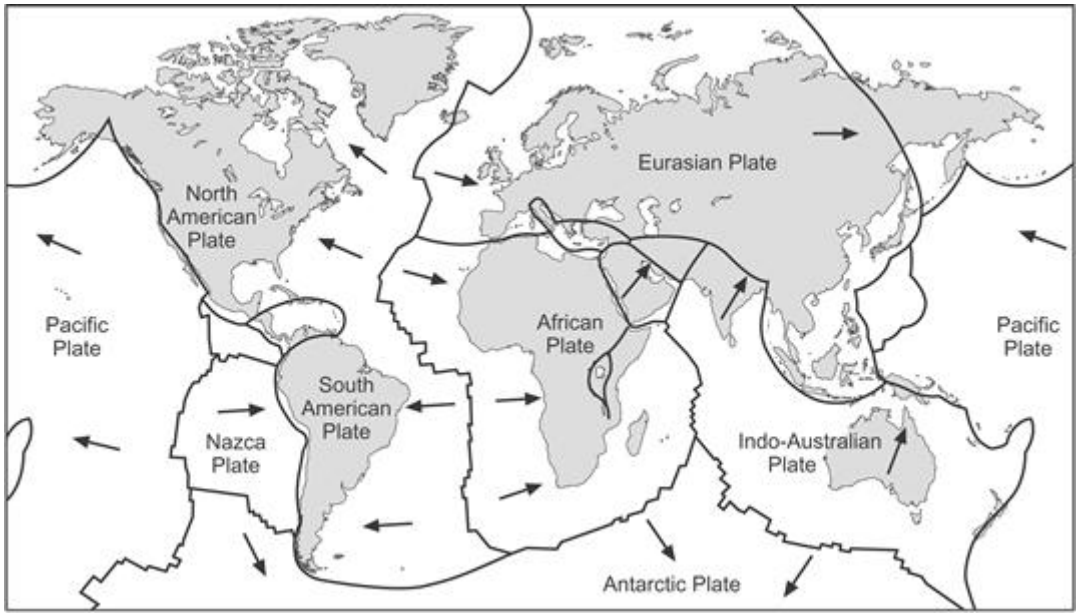
Plate Boundaries - Teacher Notes



List the eight major plates shown on the map above

1. Indo-Australian Plate
2. Antarctic Plate
3. African Plate
4. Pacific Plate
5. Eurasian Plate
6. North American Plate
7. South American Plate
8. Nazca Plate

There are many minor plates.
Does Australia sit at the edge of a continental plate? No

Does the location of Australia mean it will be unaffected by plate tectonic movements?
NO. It will not be affected as much as places like San Francisco that sits on the margins of two moving plates and consequently suffers severe earthquakes or like the Pacific Ring of Fire that suffers frequent volcanic activity. However major earthquakes at the margin of our plate and elsewhere will eventually reach Australia but their effect will be diminished. Stress created by movement at the margin of our plate is also accommodated by minor earthquakes within the plate.

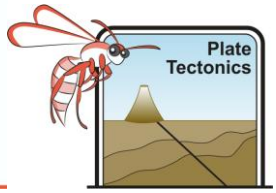
Convergent, or Destructive, Plate Boundaries

Convergent boundaries are called “destructive boundaries” as crust length is shortened

Using the information gained from the previous experiments on viscosity and density, suggest what might happen when:

A. A continental plate converges with an oceanic plate, for example where the oceanic Nazca Plate is moving west towards the South American Plate. (See diagram above)

The denser Nazca Plate is subducted/pushed under the lighter South American Plate. Where it turns



to slip below the continental plate a deep oceanic trench is created. Movement along the subduction zone causes frequent earthquakes. Melted oceanic plate and pieces of asthenosphere rise to form the explosive volcanoes of the Andes Mountains.

B. Two continental plates converge, for example where the Indian Plate is converging with the Eurasian Plate

Since both plates have the same density when they collide they form high folded sedimentary mountain chains. In this case the Himalaya Mountains are raised and crumpled. Although earthquakes are produced there is no volcanic activity as there is no subduction.

These explanations are a little simplistic as although oceanic crust is dense, a thin layer of continental material that will be subducted with it always overlies it. The varying proportions of each will produce different results. Water and gases from melted continental material will also affect the final style of volcanism.

C. Older denser oceanic crust converges with younger less dense oceanic crust, for example where older Australian Plate meets the younger New Zealand Plate

Violent earthquakes and volcanism occurs. E.g. Indonesian Island Arc and New Zealand where the Pacific and Australian plates are colliding

Using the map above name three convergent plate boundaries. _____

Divergent Boundaries

Constructive boundaries, also known as ***divergent boundaries***, occur where two plates move apart. They are called constructive because seafloor spreading extends the crust.

Teacher Demonstration - Stretching the crust

Materials

- Silly putty or play dough
- Teacher or student

Warm putty in hands and roll into a thick sausage shape.
Stretch the sausage gently between two hands.
The putty should thin and sag towards the centre.

Tension thins the crust, and normal faulting produces a rift valley. Molten mafic material from oceanic crust and the mantle rises to form mid-oceanic ridges and flat basalt plains. Mafic volcanic rocks are free flowing therefore earthquakes and volcanic activity is not very destructive.

E.g. Mid-Atlantic Ridge where the North American Plate moves away from the Eurasian Plate.

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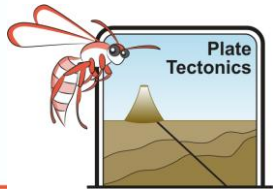

Using the map name three divergent plate boundaries. _____

Where are most divergent boundaries found? Mid-oceanic ridges

Transform Boundaries

These occur when two plates scrape past each other. There is no volcanic activity but strong earthquakes occur. E.g. San Andreas Fault where friction between the Pacific Plate and North American Plate builds up to be released in a series of earthquakes.

Animations of these three boundaries can be found at:
http://adjr06.tripod.com/id8.html

Summary

Complete the following summary statements.

At destructive (convergent) boundaries crust is subducted (pushed below and melted).
At constructive (divergent) boundaries new crust is created.
At transform boundaries crust is crumpled and broken but not subducted.
Molten continental crust is felsic (rich in silica) and magma does not flow easily.
Molten oceanic crust is mafic (rich in iron and magnesium) and flows easily.

Extension Activity

Students may wish to replicate movement at plate boundaries by:

1. Making their own stop – go animations using cameras and plasticine/clay.
2. Drawing cartoons or posters explaining the different types of movement and the results of their movement.
3. Dramatic performances with students taking on the parts of plates and observers.
4. Using Google satellite imaging to locate major active plate margins.