DIVERGENT BOUNDARIES OCCUR WHEN PLATES MOVE APART.

Plates can diverge under an ocean or under continents

- rising magma forces the two plates apart causing a rift

- If the rift is between two oceanic plates, mid-ocean ridges are formed (remember seafloor spreading)

- If the rift is between two continental plates, rift valleys are formed

FORMATION OF MID-OCEAN RIDGES

1. magma rises and pushes through the rifts

2. it piles up high and cools enough to form ridges

3. as the plates diverge, the rocks sink as they cool completely

4. smaller ridges are left

5. the ridge at the rift is always the highest because that's where fresh lava is emerging and cooling
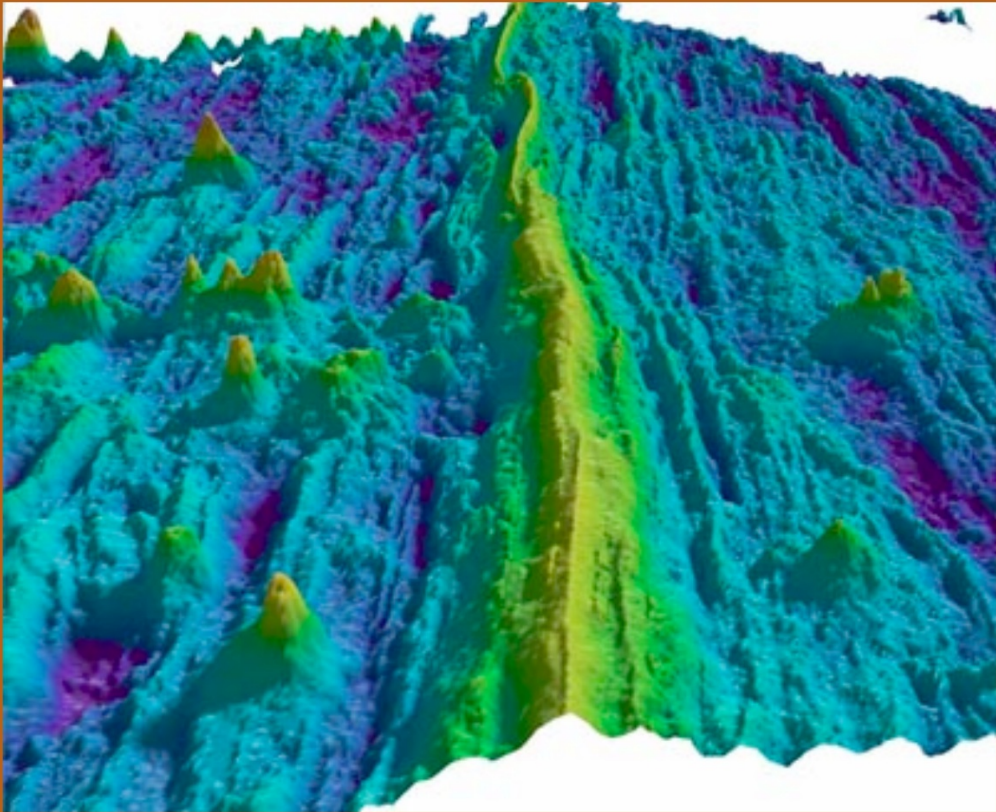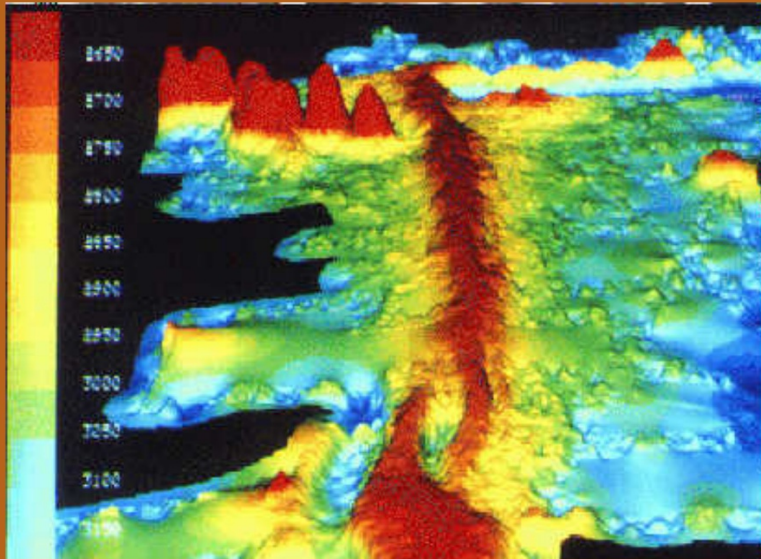
Image Credit: http://oceansjsu.cc

Image Credit: http://oceansjsu.cc

FORMATION OF RIFT VALLEYS

1. Magma rises and pushes plates apart
2. The continental crust and lithosphere get stretched
3. As it stretches, it collapses or sinks, forming valleys
4. Lava doesn't breach the surface because of how thick the crust and lithosphere are
5. Over time, these valleys fill with water to form rivers and seas and oceans
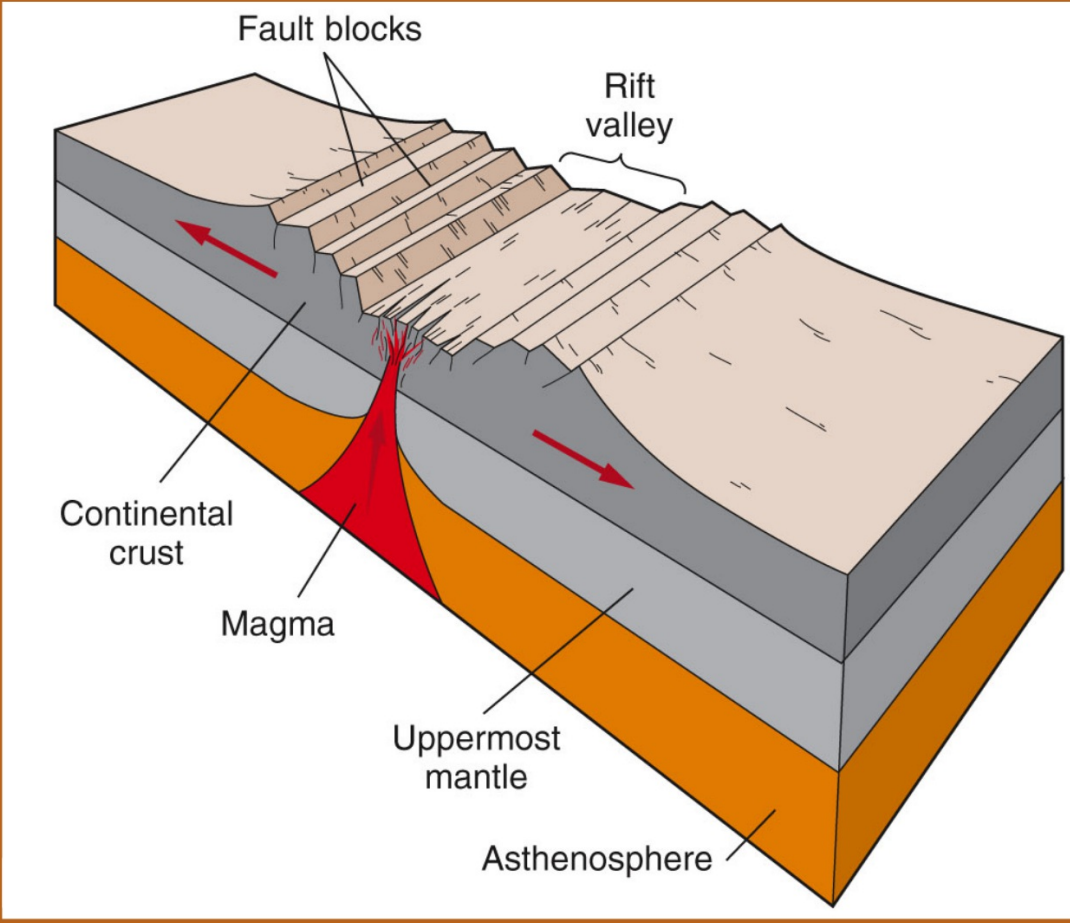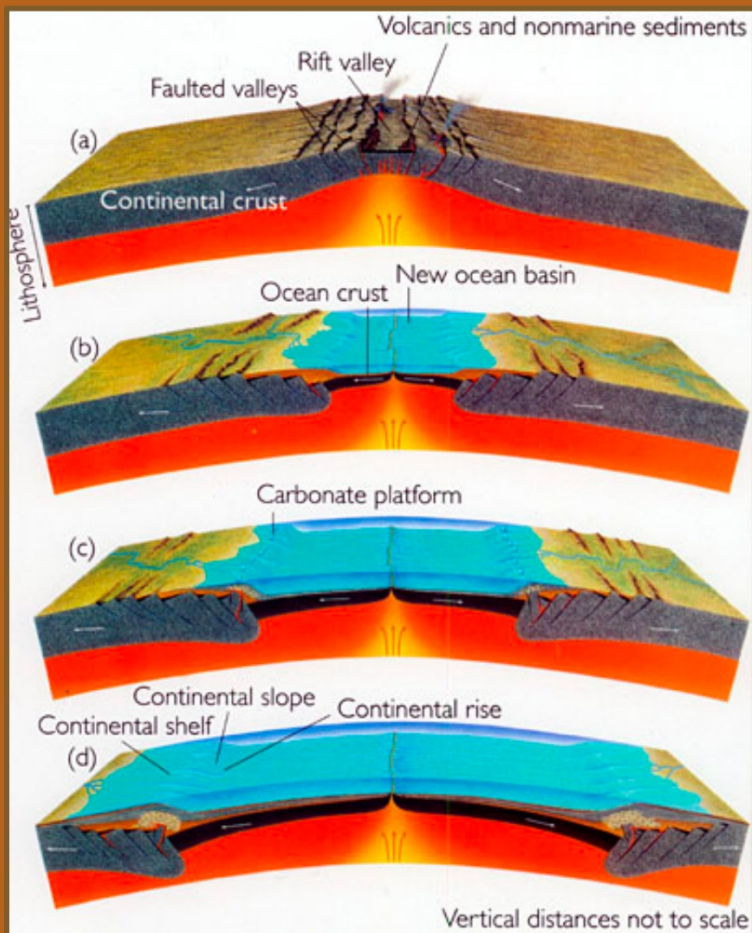6. When it becomes thin enough, lava can breach the surface

Fault blocks

Rift valley

Continental crust

Magma

Uppermost mantle

Asthenosphere

Image Credit: www.geogrify.n

Volcanics and nonmarine sediments
Rift valley
Faulted valleys
(a)
Lithosphere
Continental crust
New ocean basin
Ocean crust
(b)
Carbonate platform
(c)
Continental slope   Continental rise
Continental shelf
(d)
Vertical distances not to scale

notice how the lithosphere (Earth's plate) gets thinner and thinner

This diagram shows how large slabs of rock sink at the time of fault formation.

Image Credit: www.marinebio.n
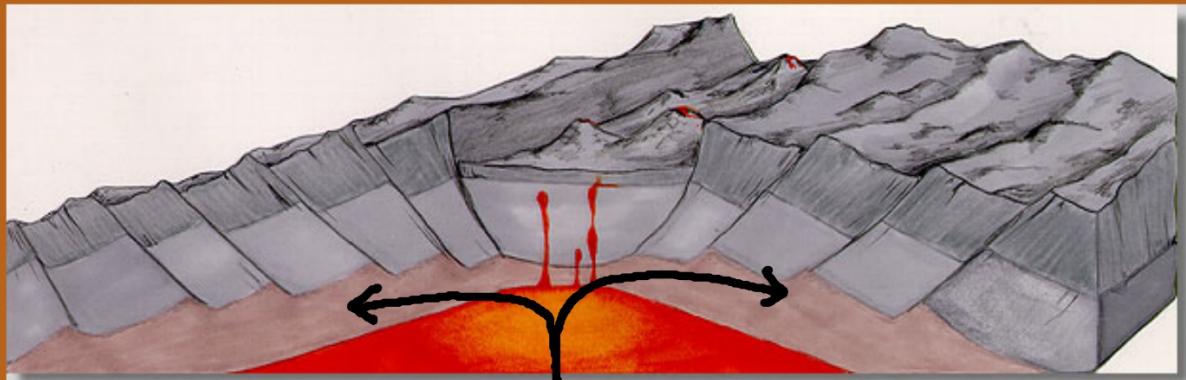
Rising hot magma

Kenya's Rift Valley

http://www.freewebs.com/jenniferdianesmith/pix/kenya_aug04.ht

Iceland's rift valley

Image Credit: wwvgeology.iupui.ed

Why do ridges form under water but valleys form on land?
(A Good Essay Question)

- oceanic crust is thin, so magma breaches the surface and cools to form ridges

- continental crust is thick, so magma doesn't breach the surface

    - as rising magma spreads the plates apart, the continental crust is thinned

    - the thinned crust collapses / sinks and forms valleys

Move me

CONVERGENT BOUNDARIES OCCUR
WHEN TWO PLATES COLLIDE

CONVERGENT BOUNDARY TYPE 1:
TWO CONTINENTS CONVERGE (COLLIDE)

- When two continents collide, they crush and push upwards to form mountain ranges like Mt. Everest and the rest of the Himalyas
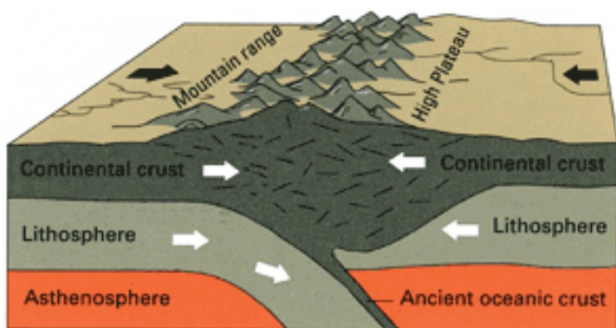
    This is often called Continental Collision

One of the Himalayas many peaks

Image Credit: wwvigf.fuw.edu.p

CONTINENTAL COLLISION

Continental-continental convergence

These two plates are converging (compressing or being pushed together).

- As they compress, they crush each other
- one sinks while the other rises up

Mountain ranges are created as the colliding crust is compressed and pushed upwards. (the picture doesn't show the crushing and pushing upward)
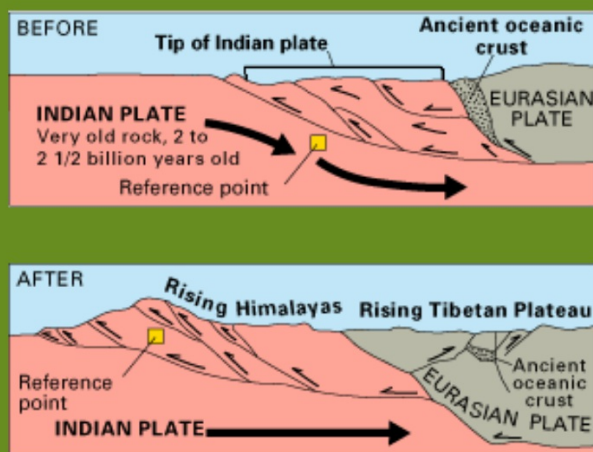
CONTINENTAL COLLISION

BEFORE

Tip of Indian plate

Ancient oceanic crust

EURASIAN PLATE

INDIAN PLATE
Very old rock, 2 to
2 1/2 billion years old

Reference point

AFTER

Rising Himalayas   Rising Tibetan Plateau

Ancient oceanic crust

EURASIAN PLATE

Reference point

INDIAN PLATE

Image Credit: http://pubs.usgs.g

Two plates are colliding here, the Indian (pink) and the Eurasian (brown) plate.

Notice that the Indian plate is getting crushed upwards by the Eurasian plate.

Discussion: Why do you think the Indian plate is crushed while the Eurasian plate remains uncrushed?

PROCESS WHAT YOU'VE LEARNED:

Describe continental collision (not what it forms or creates)

Continental collisions occur when the continental crust of two different plates collide at convergent boundaries.

CONVERGENT BOUNDARY TYPE 2: OCEANIC CRUST CONVERGES WITH CONTINENTAL CRUST

- Oceanic crust (seafloor) is denser than continental crust

- When they collide, the denser oceanic crust sinks under the continental crust
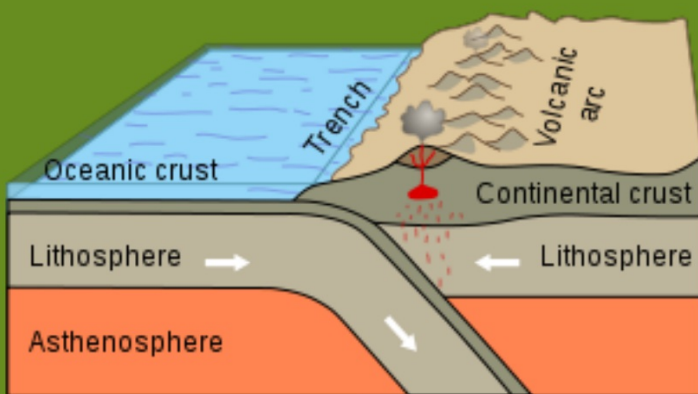
- As the oceanic crust sinks under, it brings with it trapped water

- The crust and lithosphere melt releasing carbon dioxide gas

- The trapped water evaporates into steam

- Rising gasses force magma upward

- Volcanoes are formed

CONVERGENT BOUNDARY TYPE 3: TWO OCEANIC CRUSTS CONVERGE
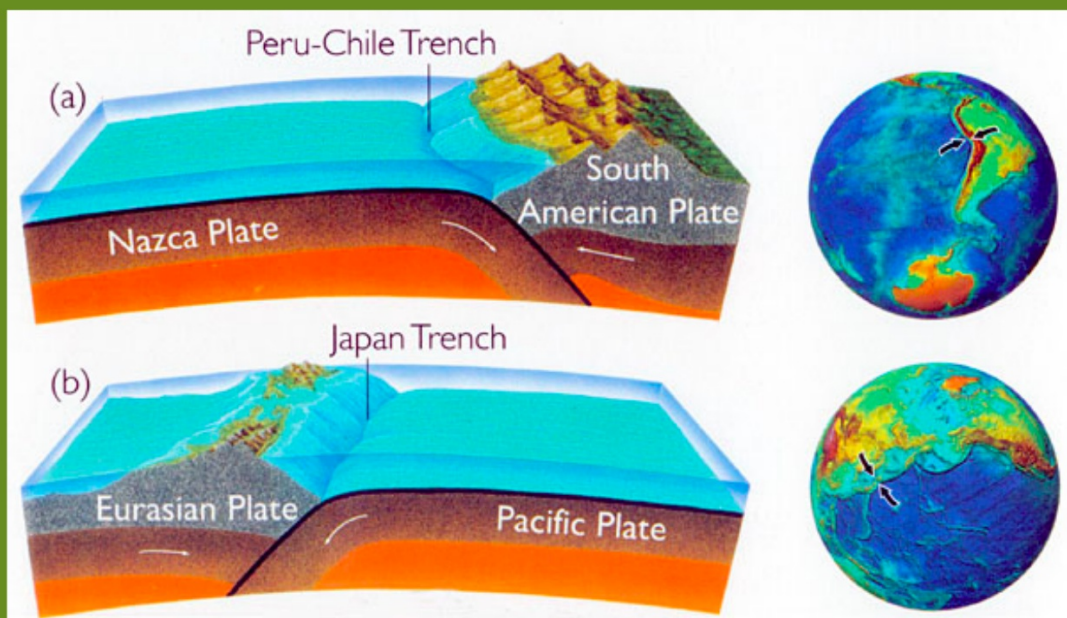
- The denser of the two subducts (sinks) under the other
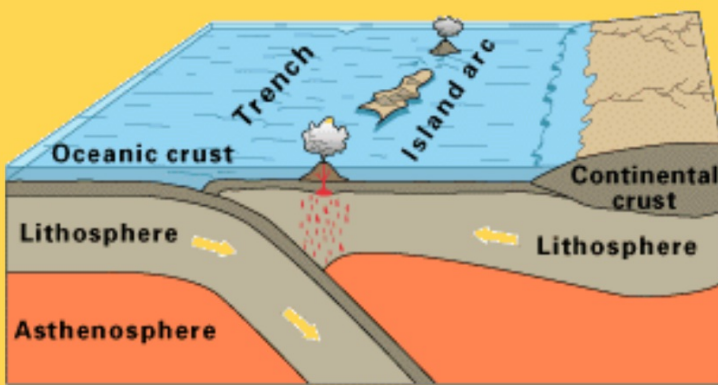
The same thing happens as with oceanic-continental convergence, except that volcanic islands are formed

This is how Japan and the Mariana Islands were formed!

Oceanic - Oceanic converge

Which picture do you think represents oceanic-oceanic convergence and why?

HOW TRENCHES ARE FORMED:

At the point where one plate subducts under another, huge oceanic trenches are formed.

These trenches are areas of the deepest parts of the oceans (like the Mariana Trench).
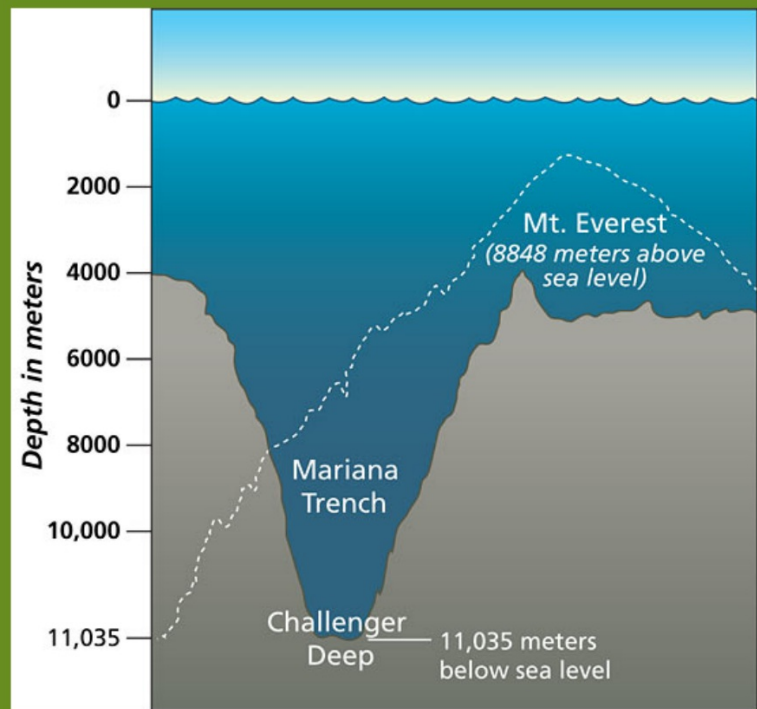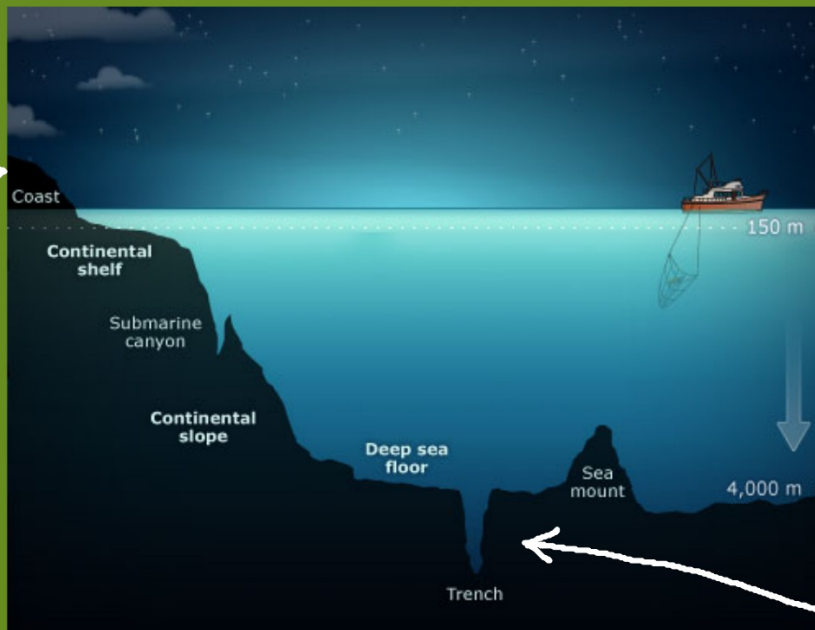

Image Credit: http://iliketowastemytime.co

The edge of the shelf may be an island, like in the case of Japan and the Mariana Islands

Strange creatures live in the trenches

Image Credit: http://www.teara.govt.r

Himantolophus paucifilosus
Football fish

Depth: 1000-4000 m
Size: females up to 45 cm

Stomias boa
Scaly dragonfish

Depth: 200-1500 m
Size: 32 cm

Munnopsis

Depth: 900-3000 m
Size: body 1-2 cm; legs 15 cm

Grimpoteuthis
Dumbo Octopus

Depth: 300-5000 m
Size: 20 cm

Image Credit: http://iliketowastemytime.cc

Notice how Japan, Guam and the Marianas Islands are part of the same trench line.

Discuss why this is.

Japan
Trench

Created by Carlos Kaukahi Severson, 201

PROCESS WHAT YOU'VE LEARNED:

Compare what happens when oceanic crust subducts under continental crust versus when it subducts under another oceanic crust.

- subduction under both create volcanoes
- subduction under continental crust creates volcanoes on already existing land
- subduction under oceanic crust creates volcanic islands
- trenches are formed in both cases

TRANSFORM BOUNDARIES: (TWO PLATES GRINDING AGAINST EACH OTHER)

The two plates can be moving in opposite directions
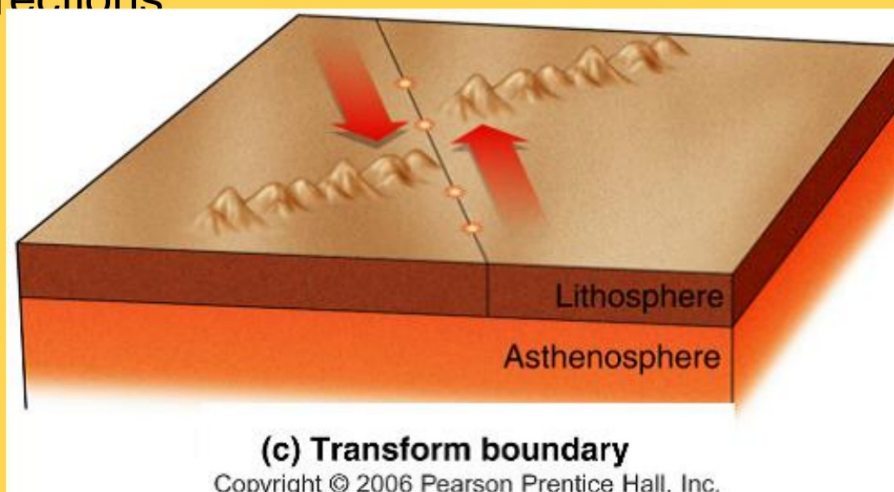
(c) **Transform boundary**

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Image Credit: wwvgomyclass.coı

Here, the South American Plate is moving west while the Antarctic plate is moving east. The Scotia Plate seems to be caught in the middle of the two.
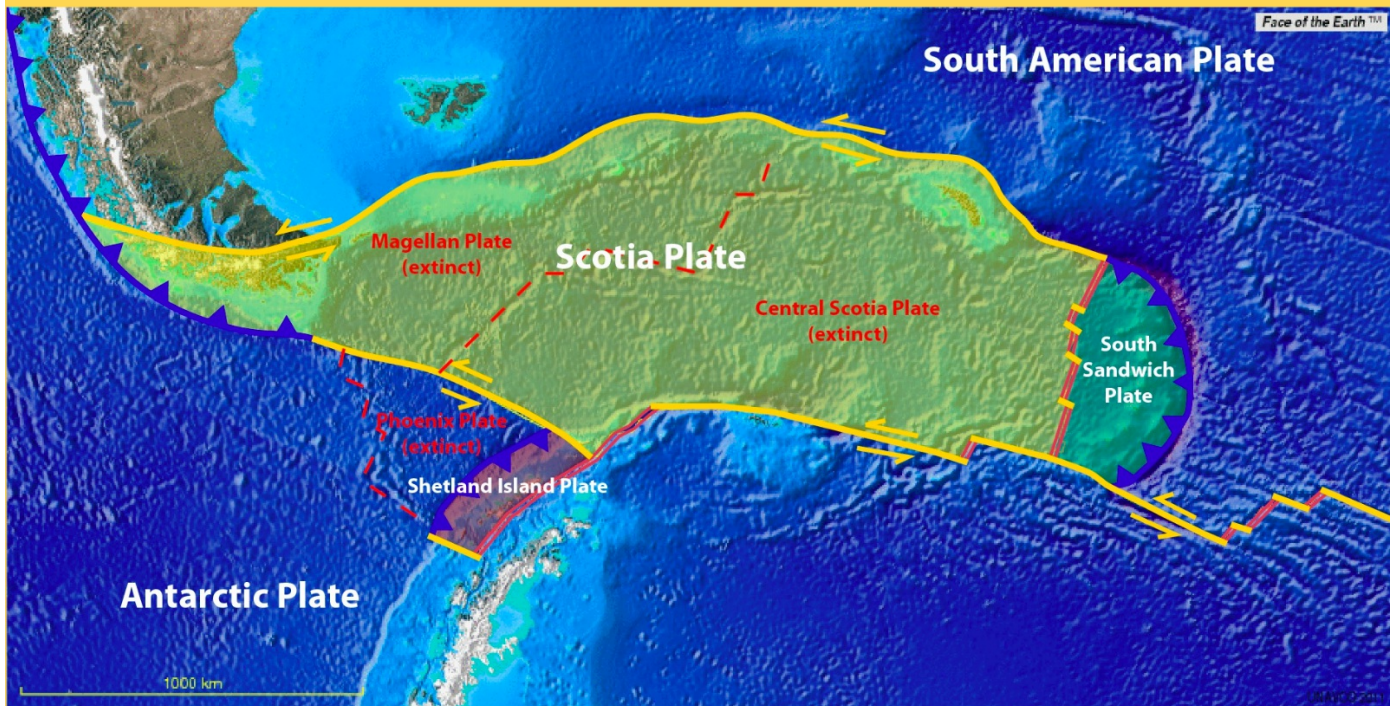

Face of the Earth ™

South American Plate

Magellan Plate (extinct)

Scotia Plate

Central Scotia Plate (extinct)

South Sandwich Plate

Phoenix Plate (extinct)

Shetland Island Plate

Antarctic Plate

1000 km

Image Credit: wwwwiki.carleton.edu

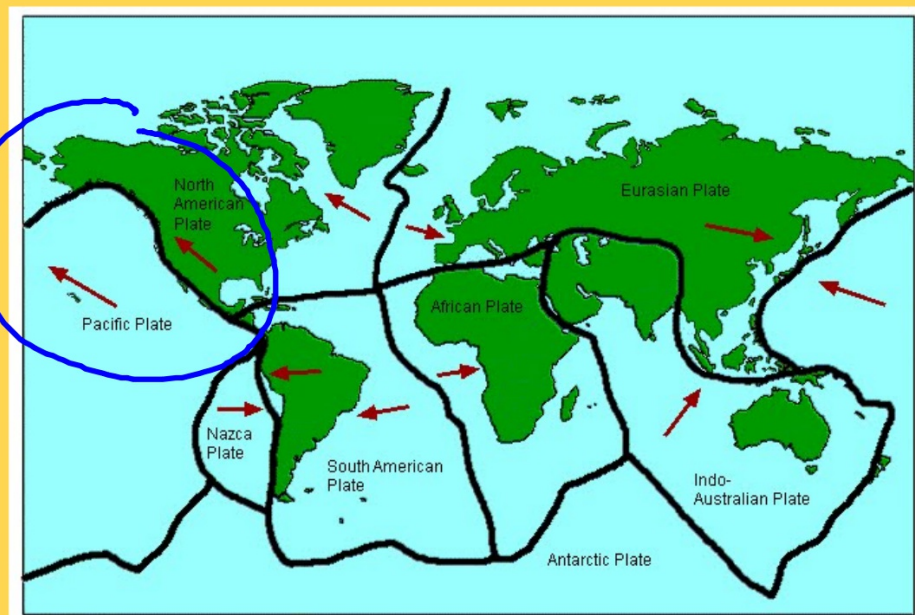Or the two plates can be moving in the same direction, but at different speeds, like at the San Andreas fault.

Image Credit: wwvfionamariecarter.wordpress.co

Transform boundaries can rip through land, forming cracks and crevices

Image Credit: http://www.hamwx.com/?p=41

Image Credit: www.PortStrategy.co