

**EFFINGHAM SECONDARY SCHOOL  
DEPARTMENT OF GEOGRAPHY**

**GEOGRAPHY**

**A.Ellan**

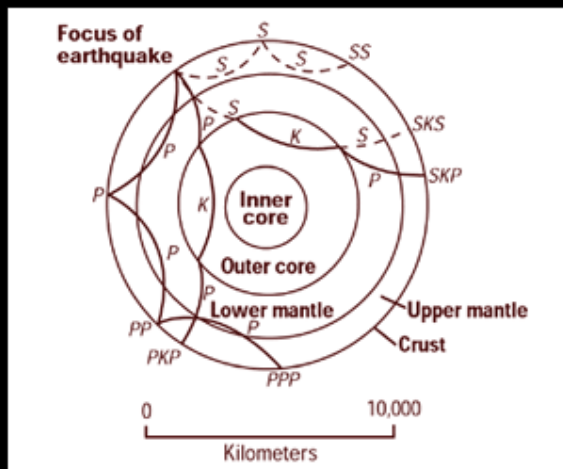
**Subject Teacher : Geography  
Grades 8-11**

# GEOMORPHOLOGY

*What are you doing  
as a geographer to  
save your planet?*

# How do we know what the Earth is made of?

- Geophysical surveys: seismic, gravity, magnetics, electrical, geodesy
  - Acquisition: land, air, sea and satellite
  - Geological surveys: fieldwork, boreholes, mines



# CONTINENTAL DRIFTING

What is Continental Drifting ?

# The Theory of Continental Drifting

- A German scientist named Alfred Wegener formed the hypothesis that the continents had moved!
- He proposed that all the continents had once been joined together in a single landmass and have since drifted apart.
- Wegener named this supercontinent Pangea.





225 million years ago



150 million years ago

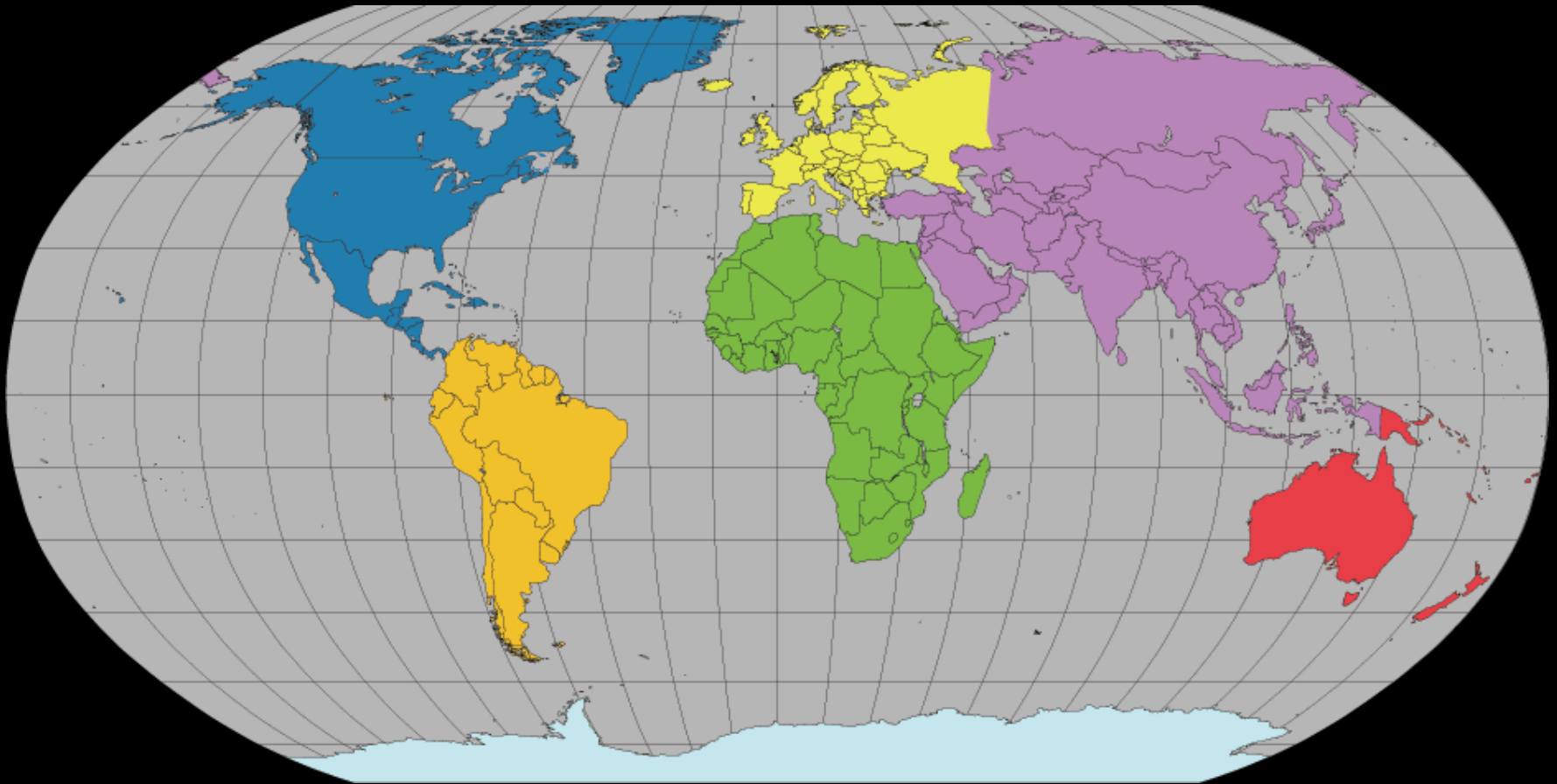


100 million years ago



Earth today

- If you look at a map of the world, you may notice that some of the continents could fit together like pieces of a puzzle.





# ALFRED WEGENER THEORY OF CONTINENTAL DRIFT

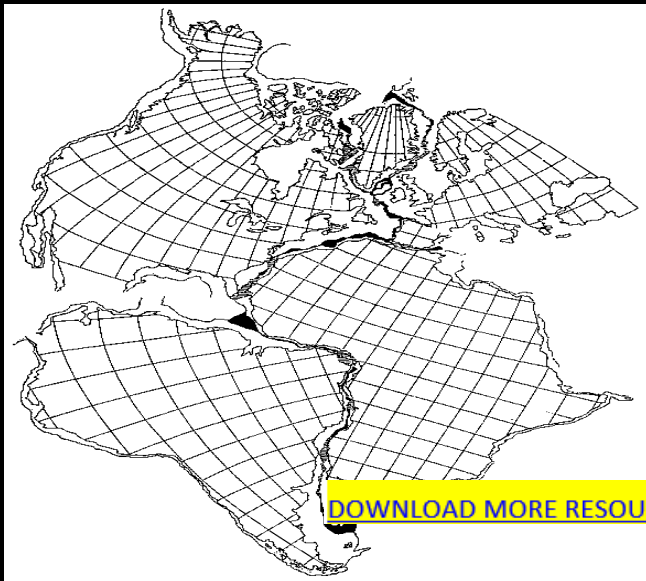
Found evidence for  
PANGAEA and  
proposed the theory of  
continental drift.



PERMIAN  
225 million years ago

# WEGENER'S EVIDENCE

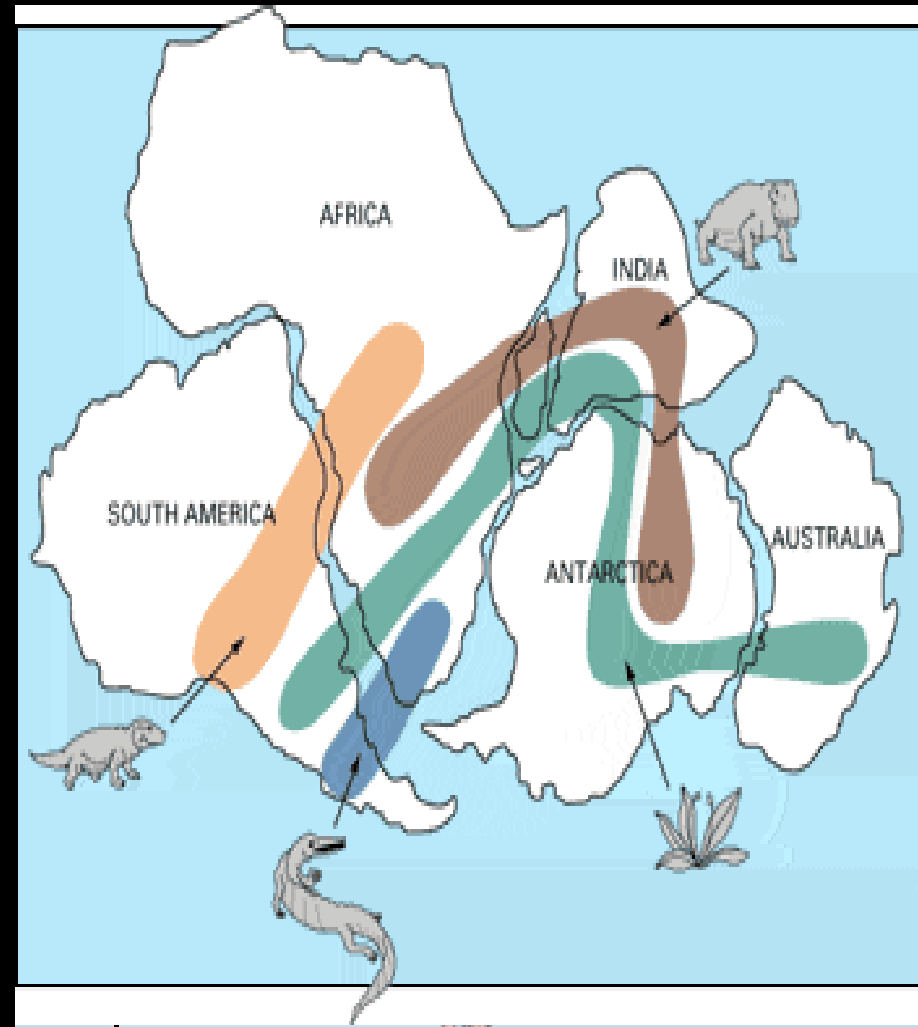
Continents  
"fit together"  
like puzzle  
pieces

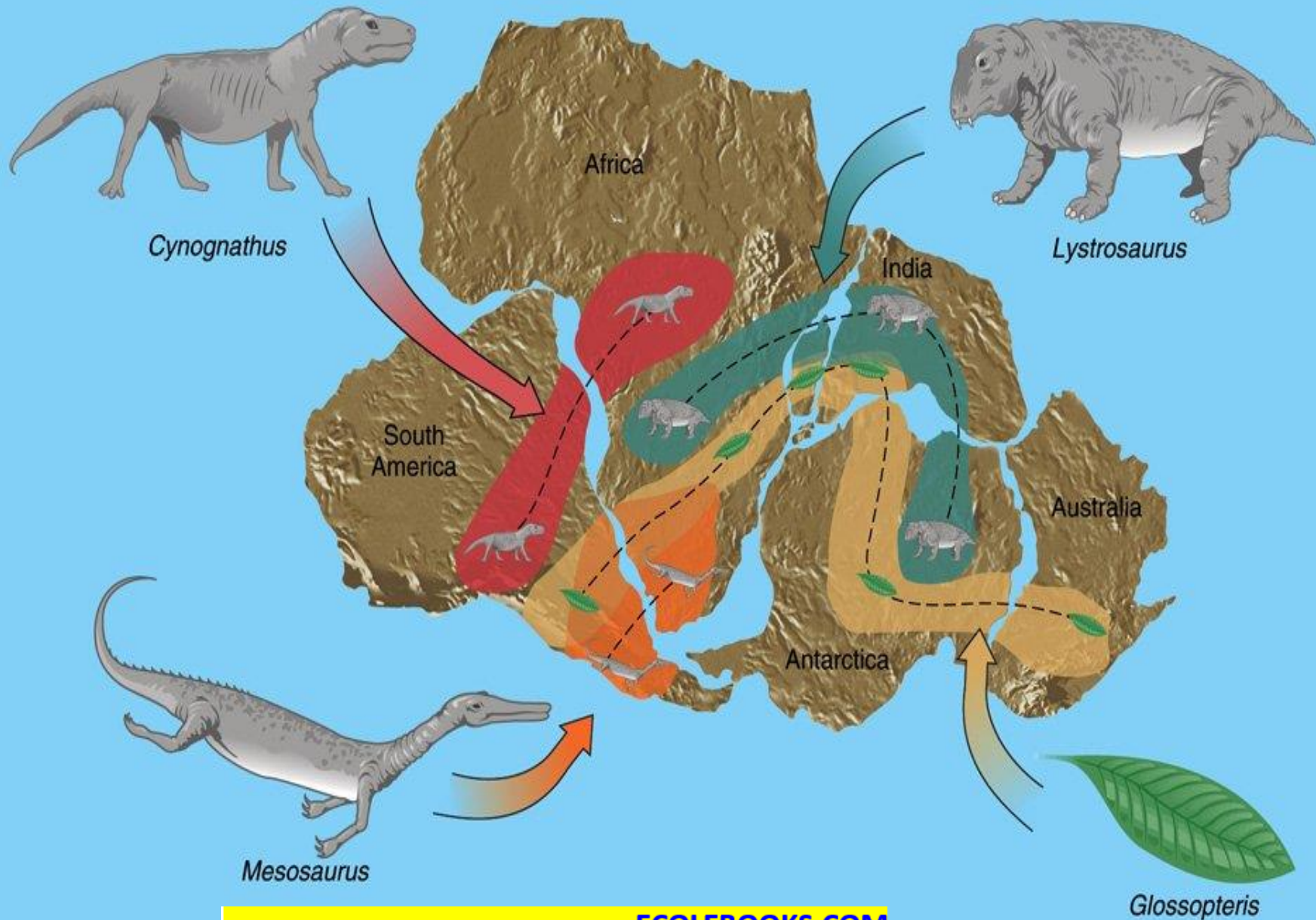


# WEGENER'S EVIDENCE

## Fossil Evidence

- *fossils are remains of living things that lived long ago.*
- *similar fossils have been discovered in matching coastlines on different continents.*





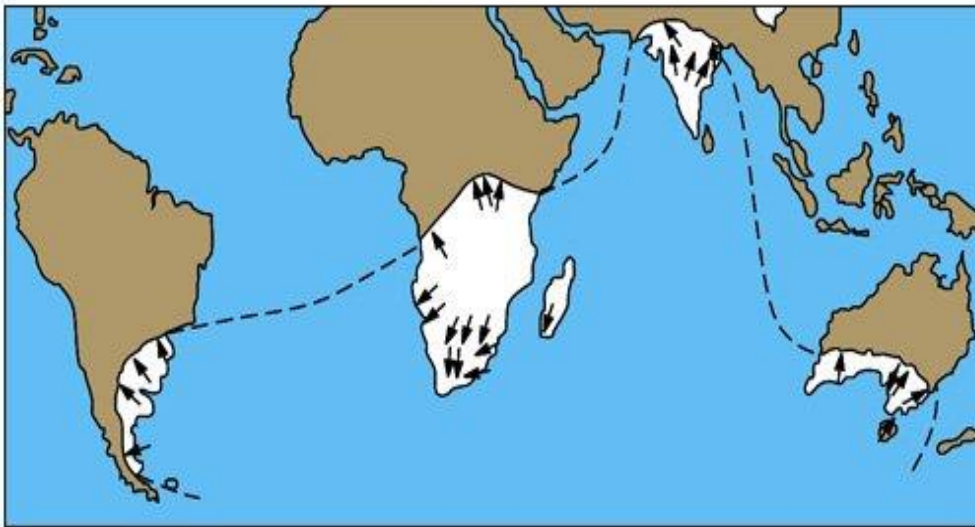
# Evidence for Continental Drift



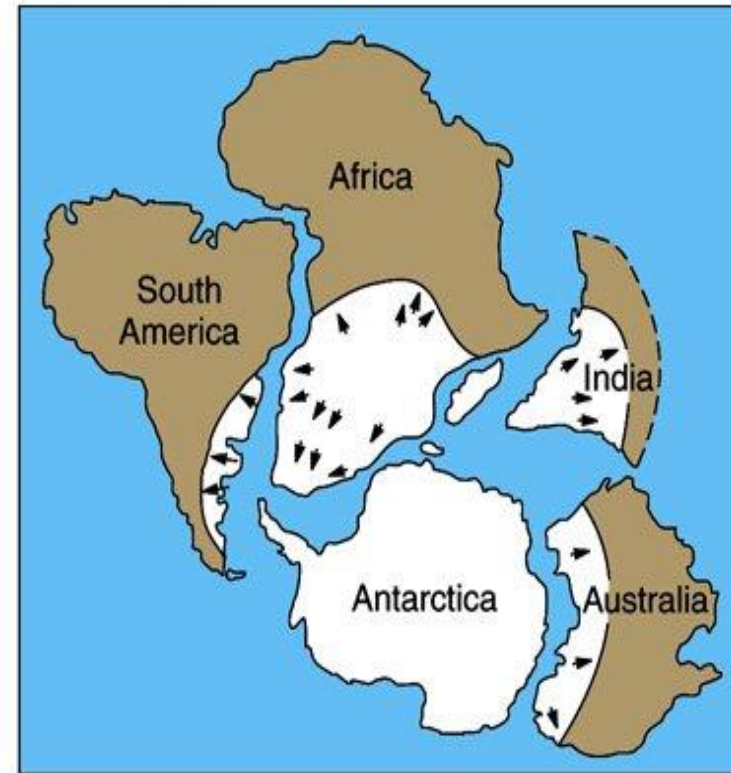
- **Evidence from fossils**
- A fossil is any trace of an ancient organism that has been preserved in rock.
- Glossopteris fossils have been found in rocks in Africa, South America, Australia, India, and Antarctica.

# WEGENER'S EVIDENCE

- Climatic evidence such as glaciers in areas that are now close to the Equator



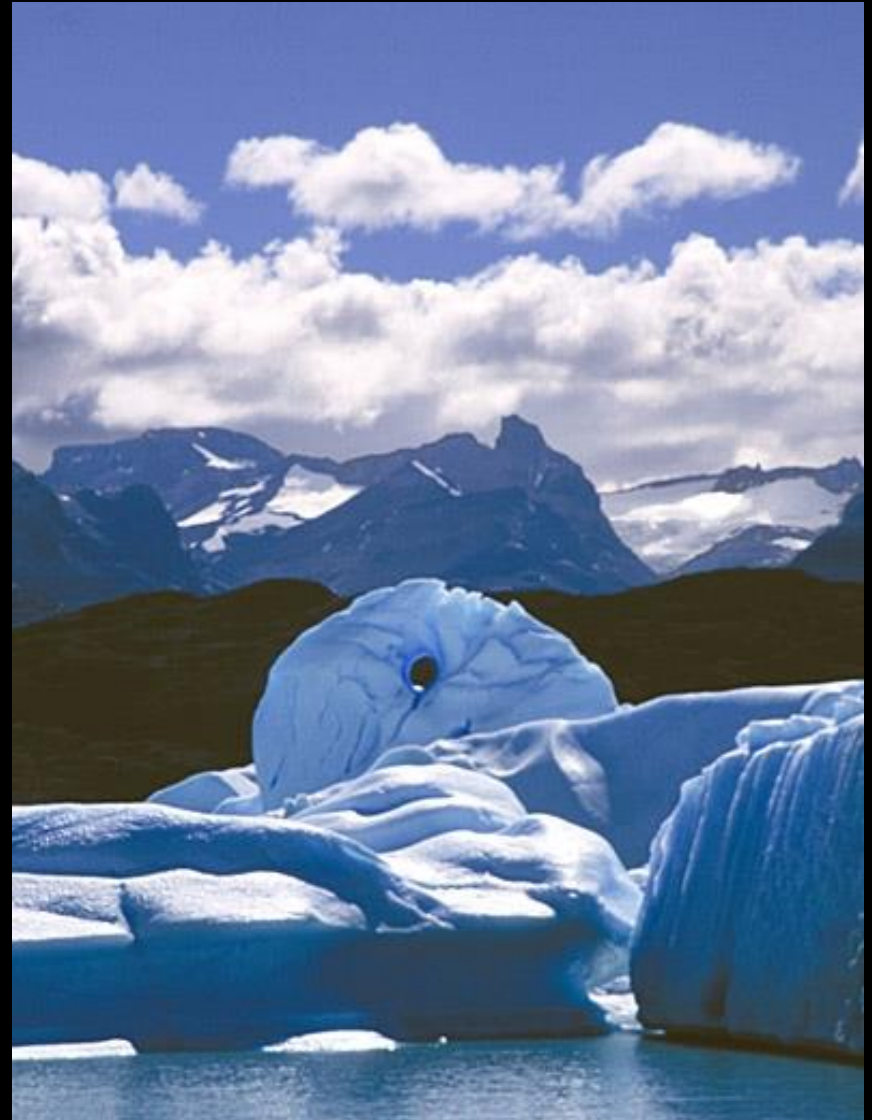
A



B

# Evidence for Continental Drift

- **Evidence from climate**
- Fossils of tropical plants have been found too far south to have survived.
- Glacier deposits are found too far north to have existed.
- These clues provide evidence that continental drift really happened.



# WEGENER'S EVIDENCE

- Mountains
  - Some mountain ranges on different continents seem to match.
    - Ex: ranges in Canada match Norway and Sweden
    - Ex: Appalachian Mtn. match UK mtn





# Evidence of Continental Drift

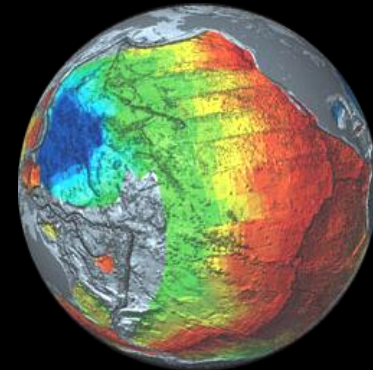
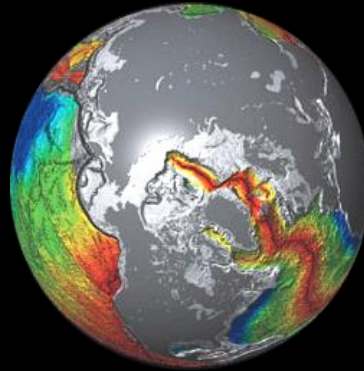
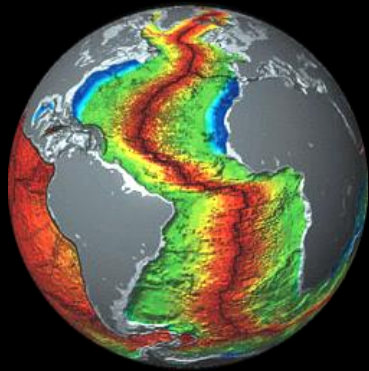
- Evidence from landforms:
- Mountain ranges and other features on the continents provided evidence for continental drift.
- Mountain ranges in South Africa line up with mountain ranges in Argentina.



# ORAL ACTIVITY & RECAP

1. Who is the scientist that proposed the theory of Continental Drifting ?
2. What is the name of the supercontinent that was formed?
3. Which present day continent evidently still exists from the continent of Laurasia ?
4. How many continents exist today ?
5. Which present day continent was once linked with Africa?

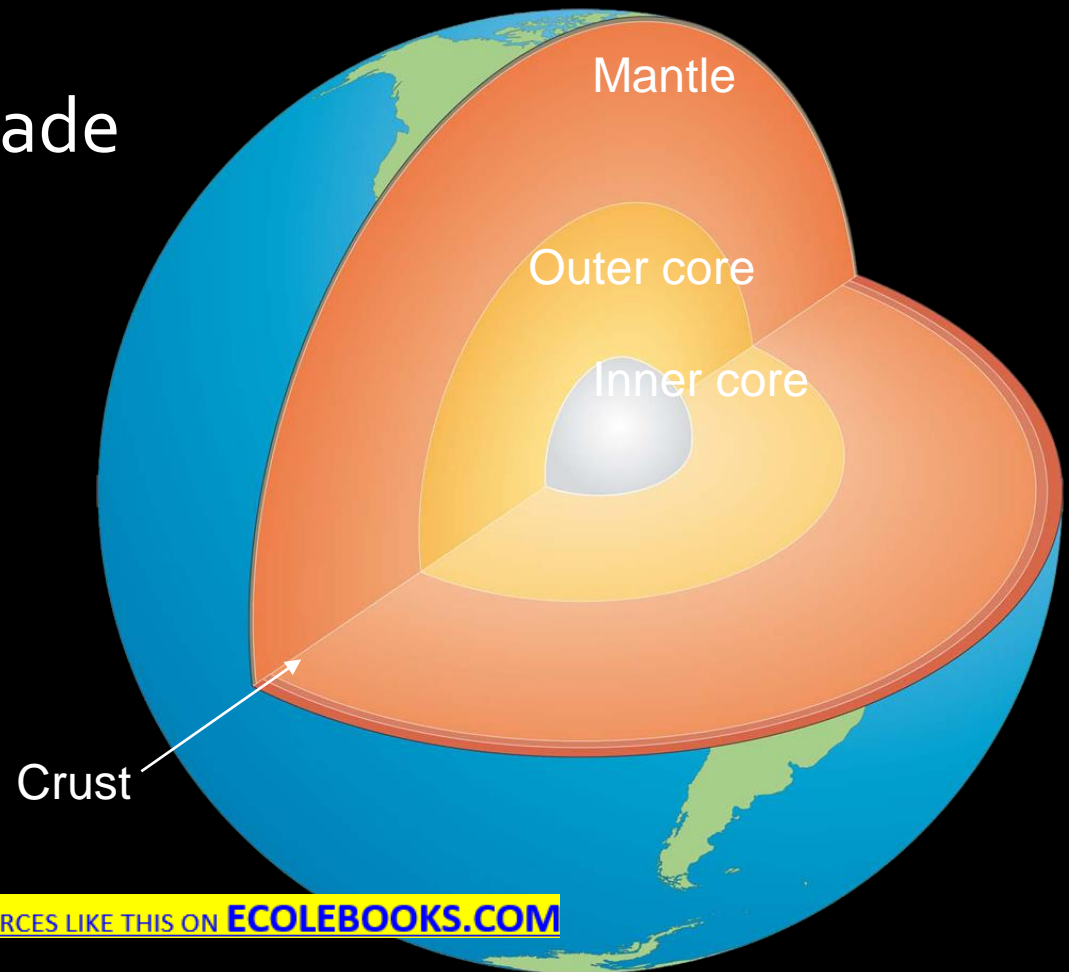
# THE STRUCTURE OF THE EARTH AND PLATE TECTONICS



# RECAP:

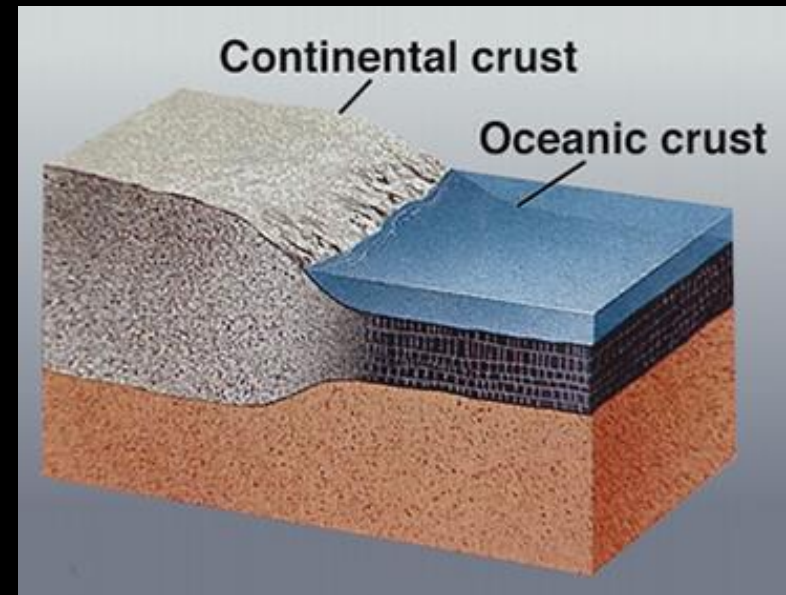
## Structure of the Earth

- The Earth is made up of 3 main layers:
  - Core
  - Mantle
  - Crust



# The Crust

- This is where we live!
- The Earth's crust is made of:



## Continental Crust

- thick (10-70km)
- buoyant (less dense than oceanic crust)
- mostly old

## Oceanic Crust

- thin (~7 km)
- dense (sinks under continental crust)
- young

# WHAT IS PLATE TECTONICS?

The scientific theory of plate tectonics supports the theory of continental drifting.

According to the theory the crust is divided into several sections called plates

There are oceanic and continental plates

# Plate Tectonics

- The Earth's crust is divided into 12 major plates which are moved in various directions.
- This plate motion causes them to collide, pull apart, or scrape against each other.
- Each type of interaction causes a characteristic set of Earth structures or "tectonic" features.
- The word, tectonic, refers to the deformation of the crust as a consequence of plate interaction.

# World Plates

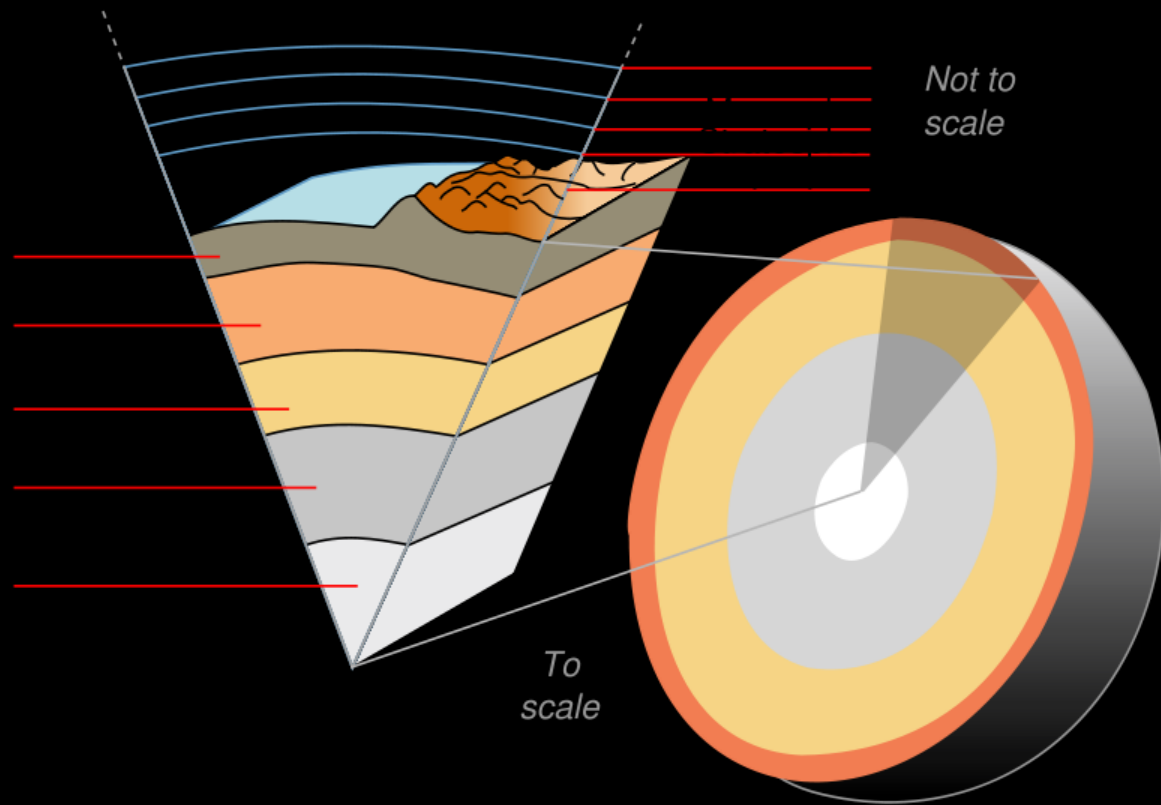




# What are tectonic plates made of?

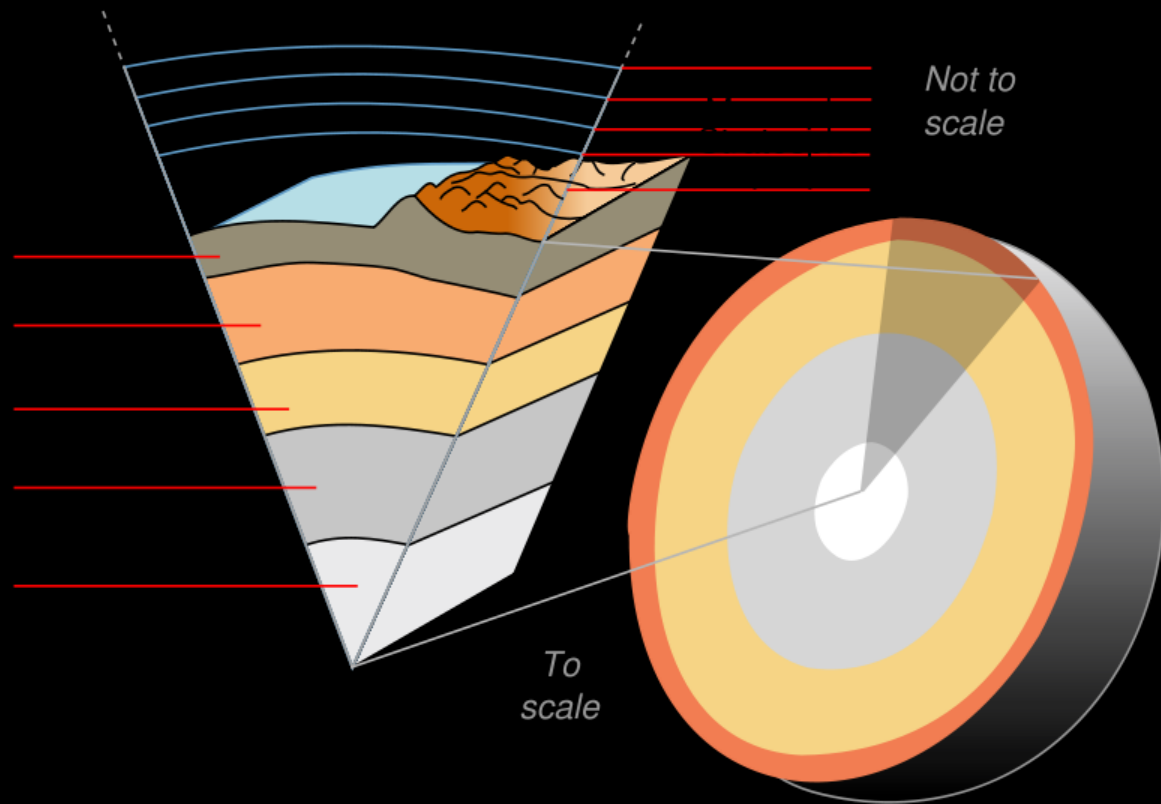
- Plates are made of rigid **lithosphere**

The lithosphere is made up of the crust and the upper part of the mantle.



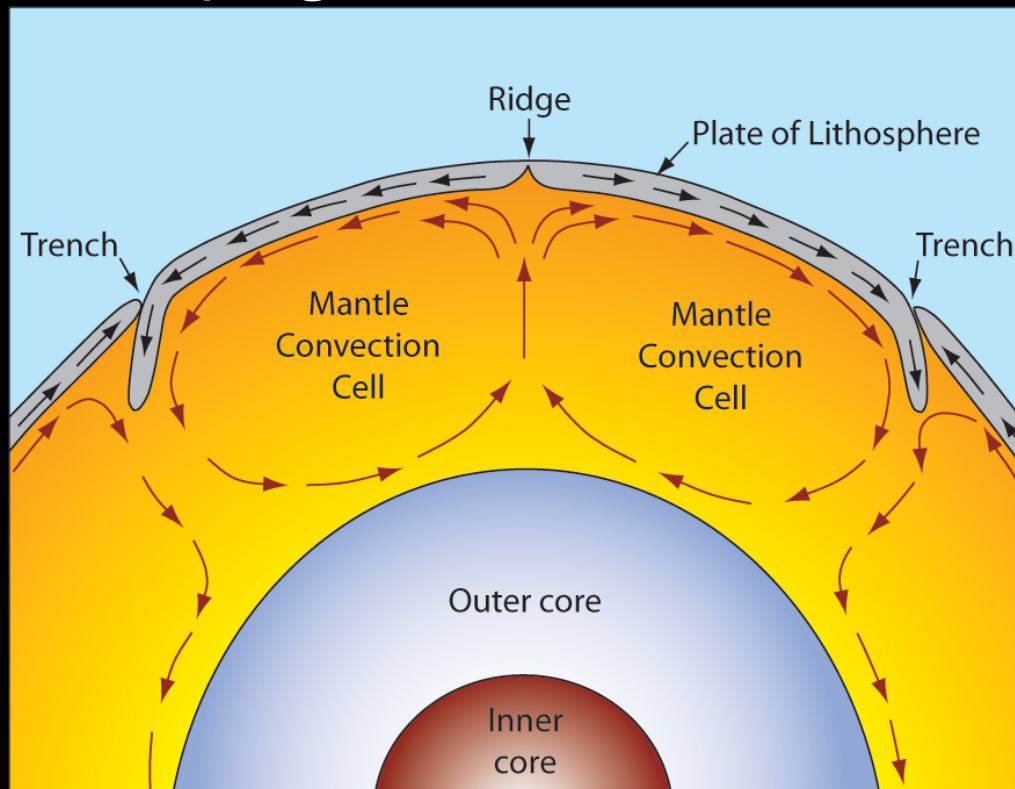
# What lies beneath the tectonic plates?

- Below the lithosphere (which makes up the tectonic plates) is the asthenosphere.



# Plate Movement

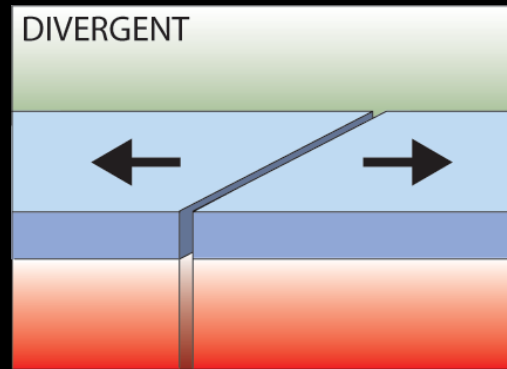
- The plates are capable of horizontal movement
- “Plates” of lithosphere are moved around by the underlying hot mantle convection cells



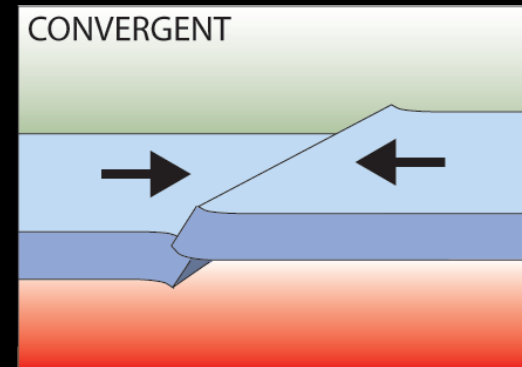
# WHAT HAPPENS AT TECTONIC PLATE BOUNDARIES?

# Three types of plate boundary

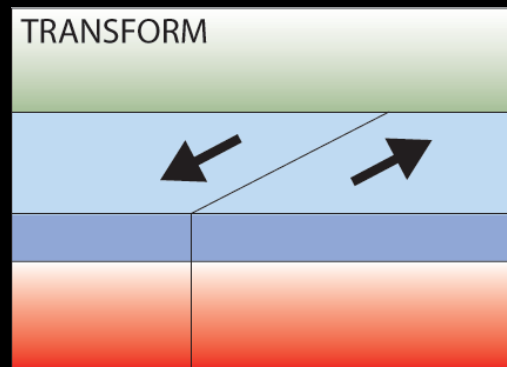
- Divergent



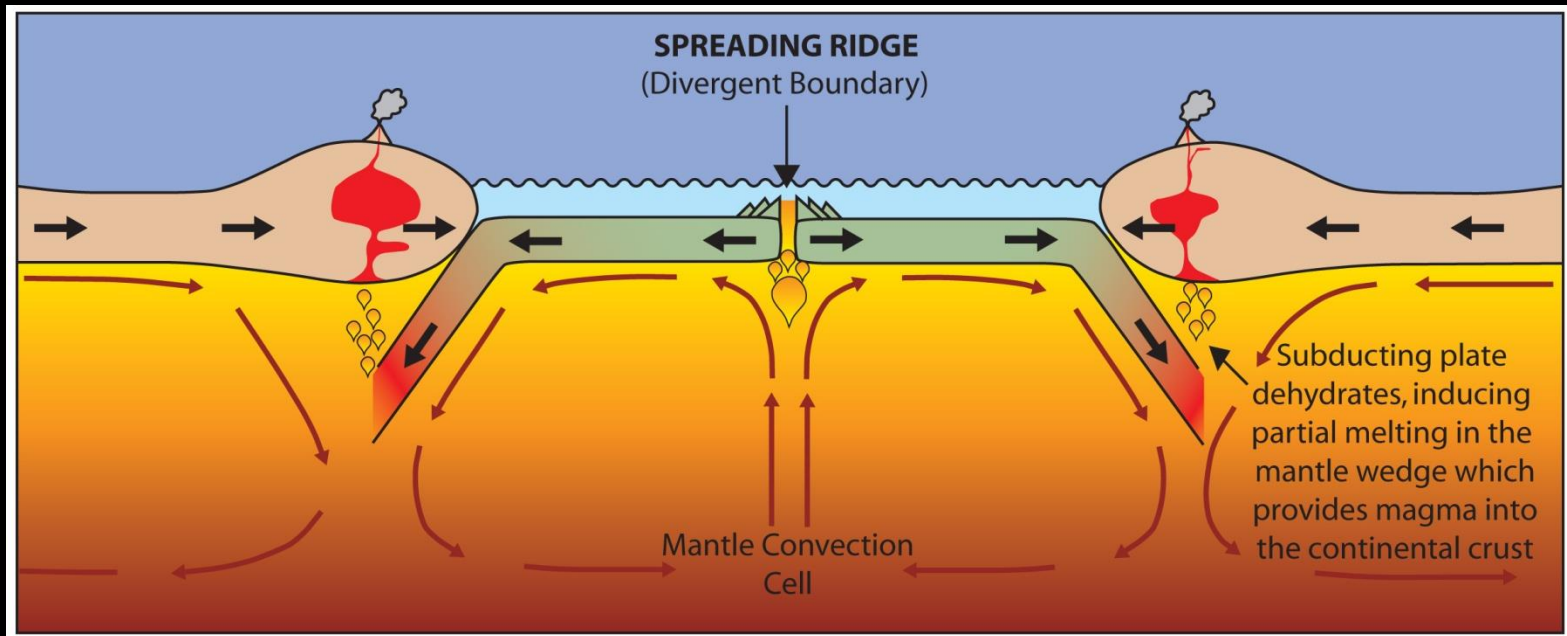
- Convergent



- Transform

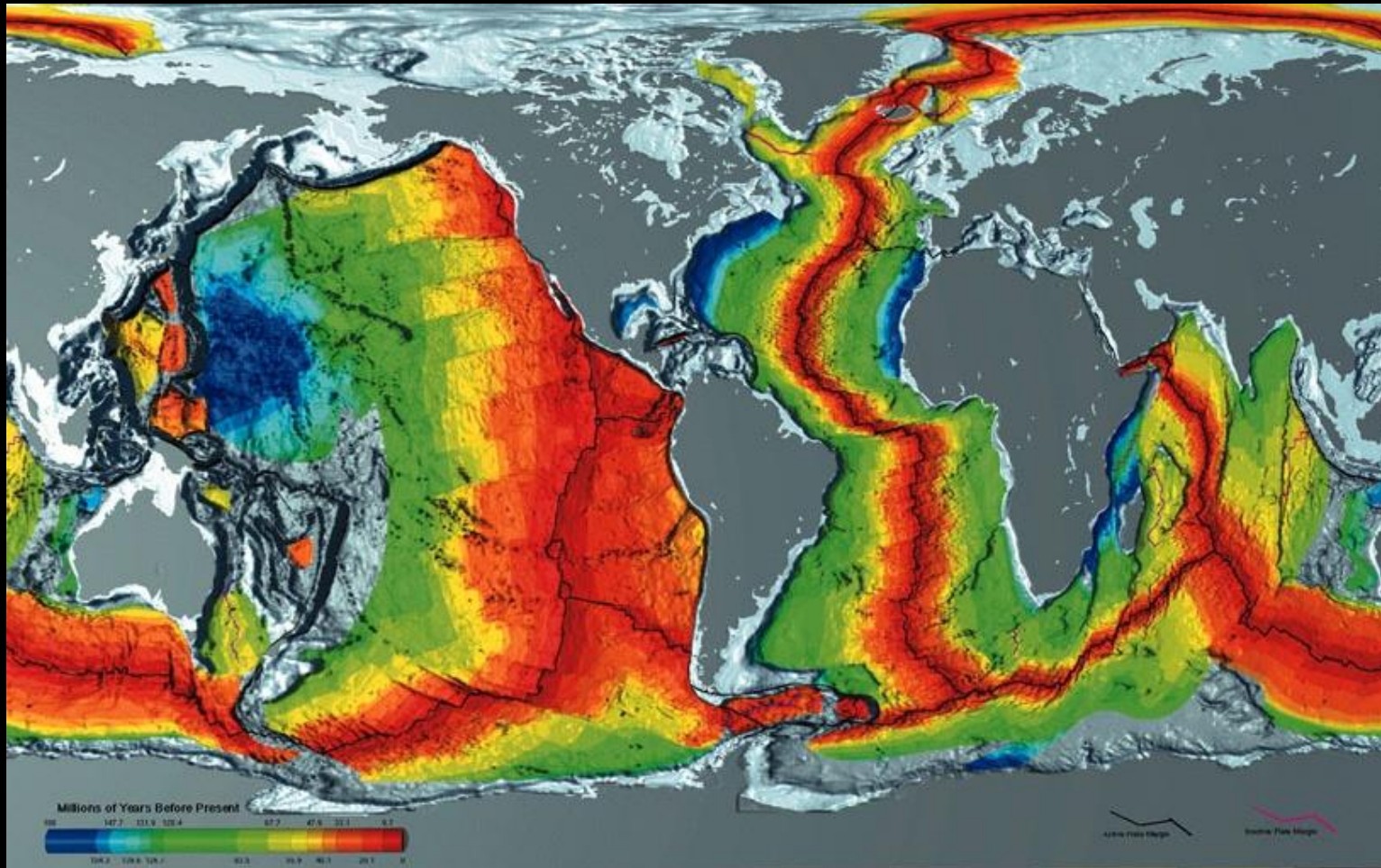


# Divergent Boundaries



- Spreading ridges
  - As plates move apart new material is erupted to fill the gap

# Age of Oceanic Crust



Courtesy of [www.ngdc.noaa.gov](http://www.ngdc.noaa.gov)

# Iceland: An example of continental rifting

- Iceland has a divergent plate boundary running through its middle



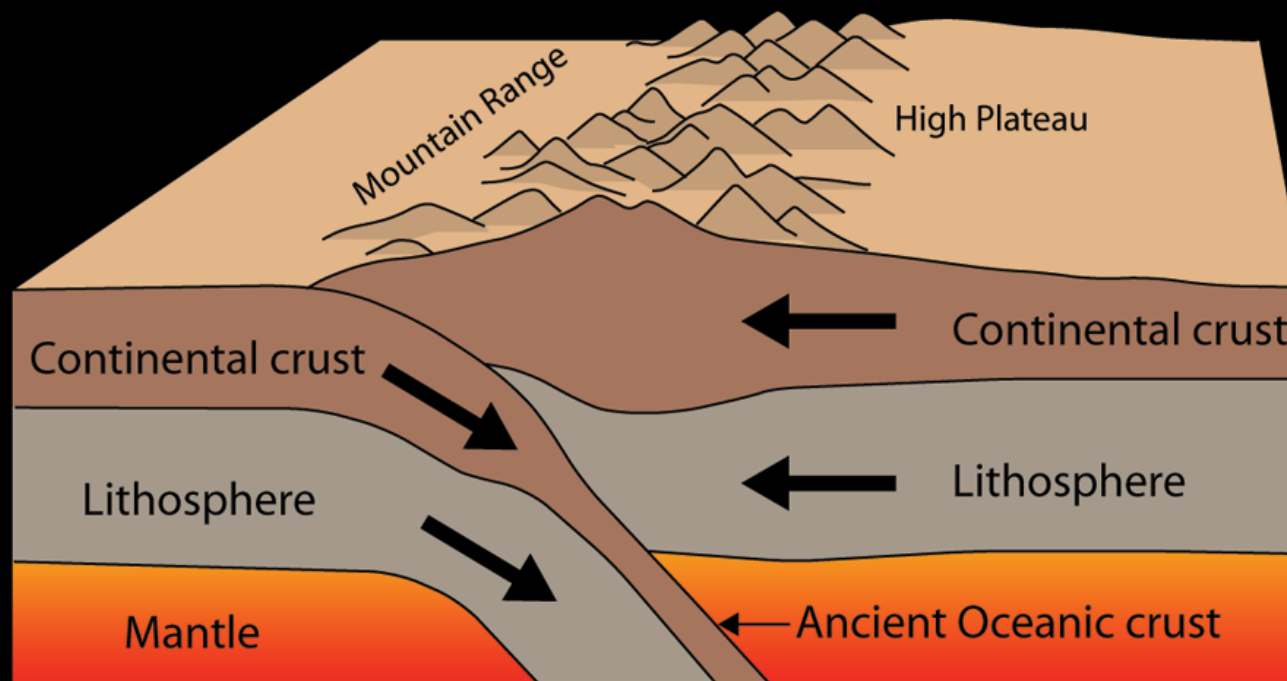


# Convergent Boundaries

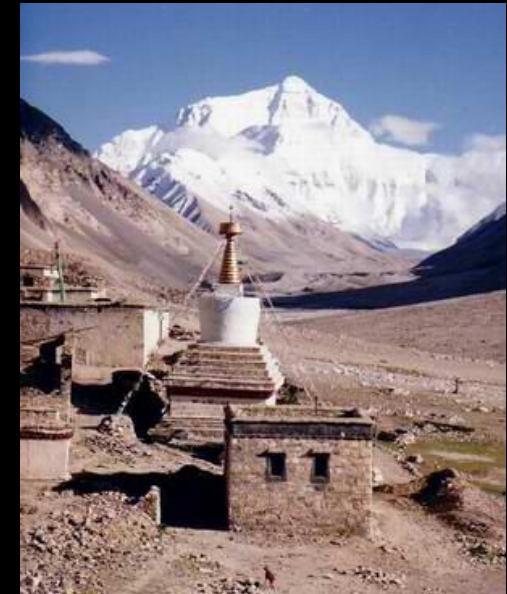
- There are three styles of convergent plate boundaries
  - Continent-continent collision
  - Continent-oceanic crust collision
  - Ocean-ocean collision

# Continent-Continent Collision

- Forms mountains, e.g. European Alps, Himalayas

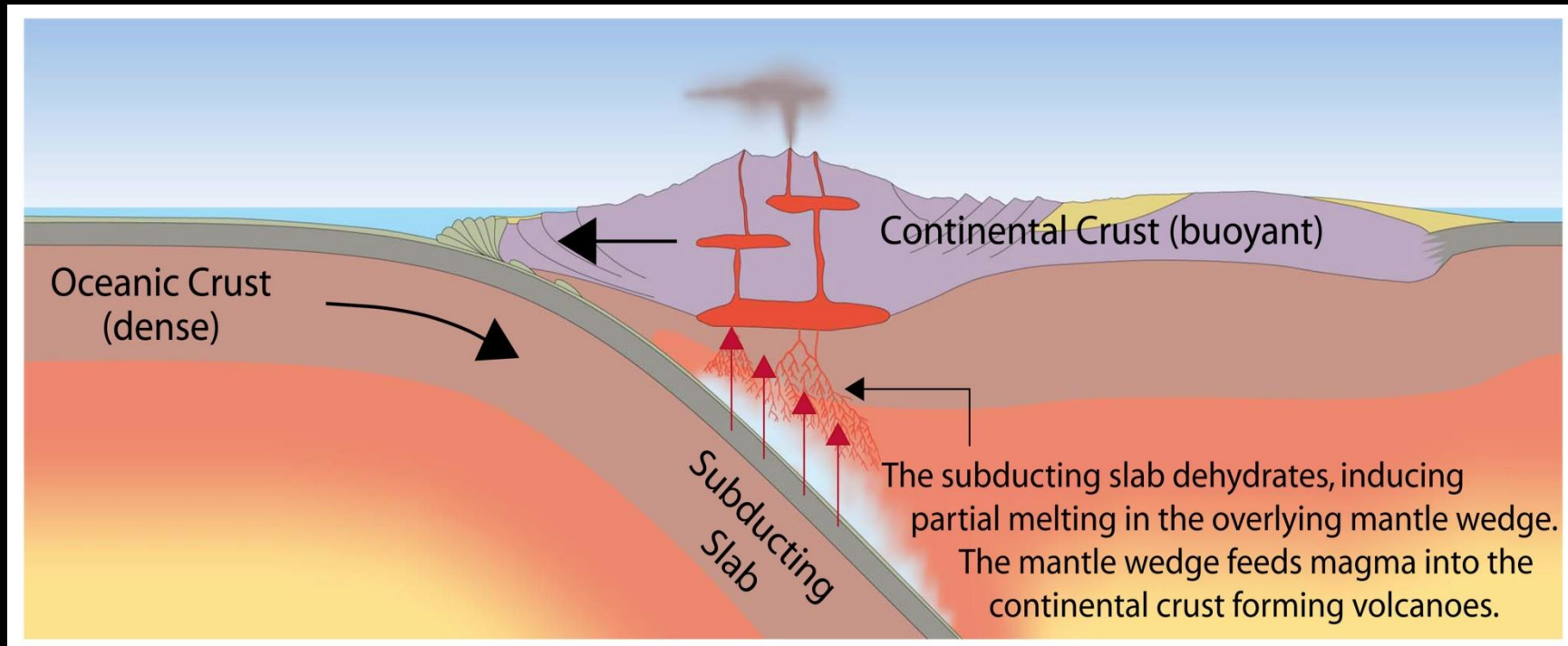


# Himalayas

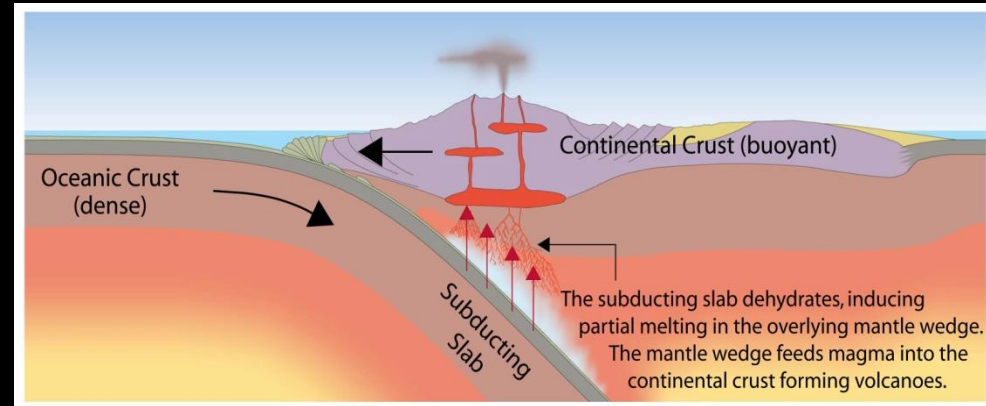


# Continent-Oceanic Crust Collision

- Called SUBDUCTION



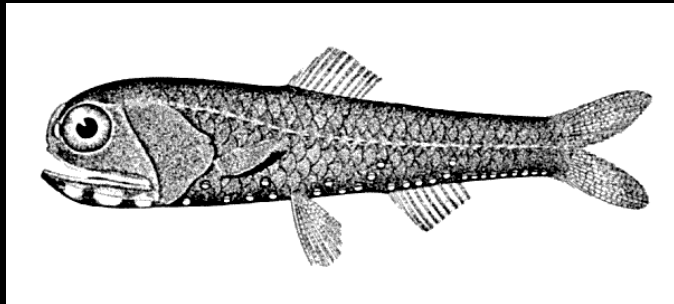
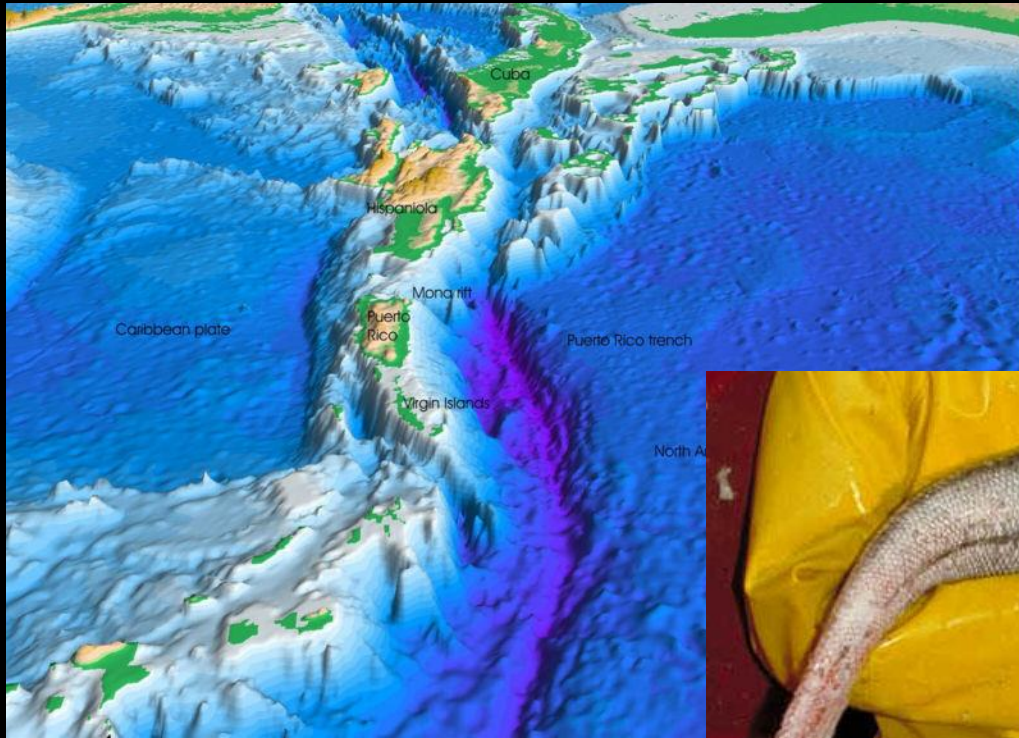
# Subduction



- Oceanic lithosphere subducts underneath the continental lithosphere
- Oceanic lithosphere heats and dehydrates as it subsides
- The melt rises forming volcanism
- E.g. The Andes

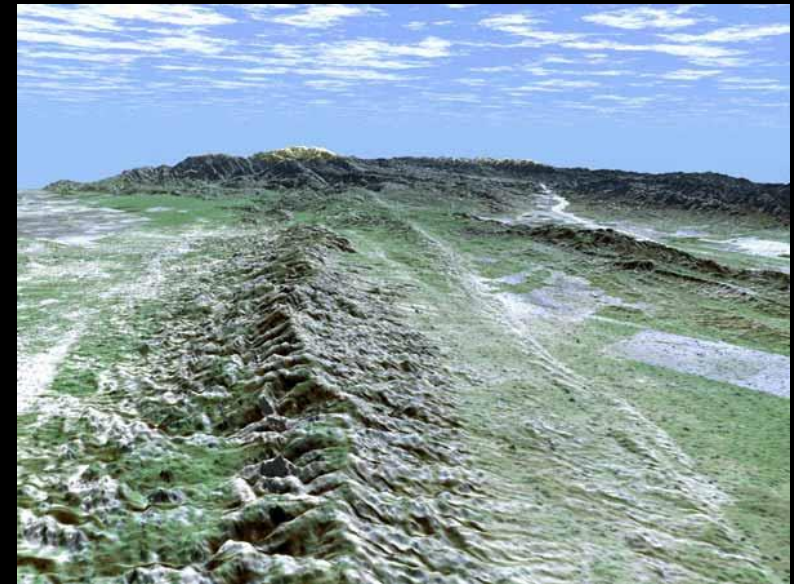
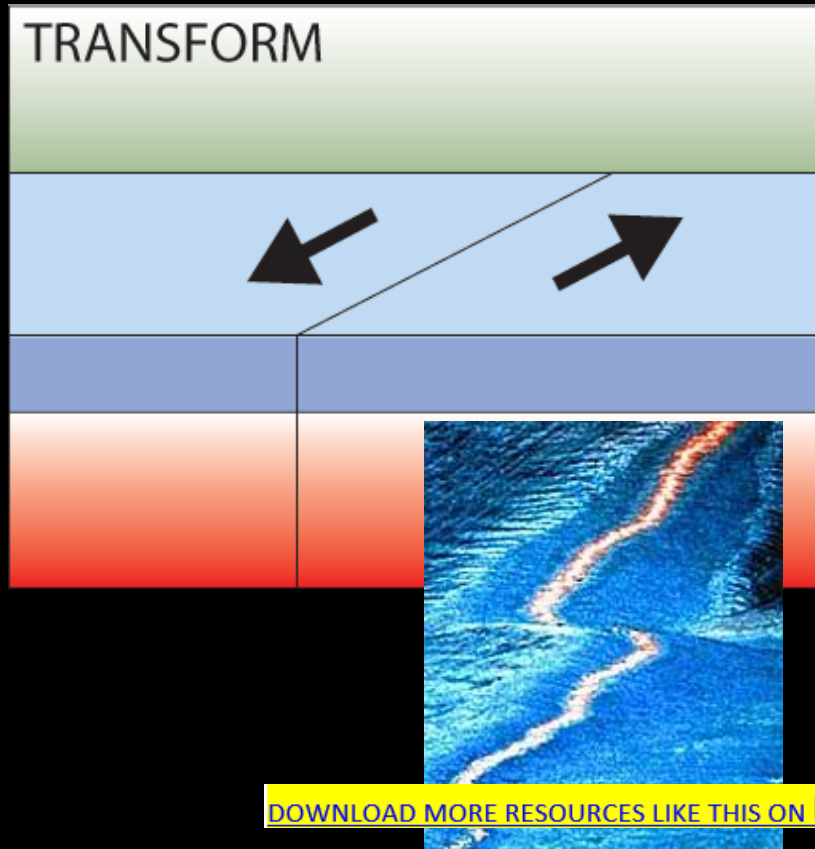
# Ocean-Ocean Plate Collision

- When two oceanic plates collide, one runs over the other which causes it to sink into the mantle forming a **subduction zone**.
- The subducting plate is bent downward to form a very deep depression in the ocean floor called a **trench**.
- The worlds deepest parts of the ocean are found along trenches.
  - E.g. The Mariana Trench is 11 km deep!



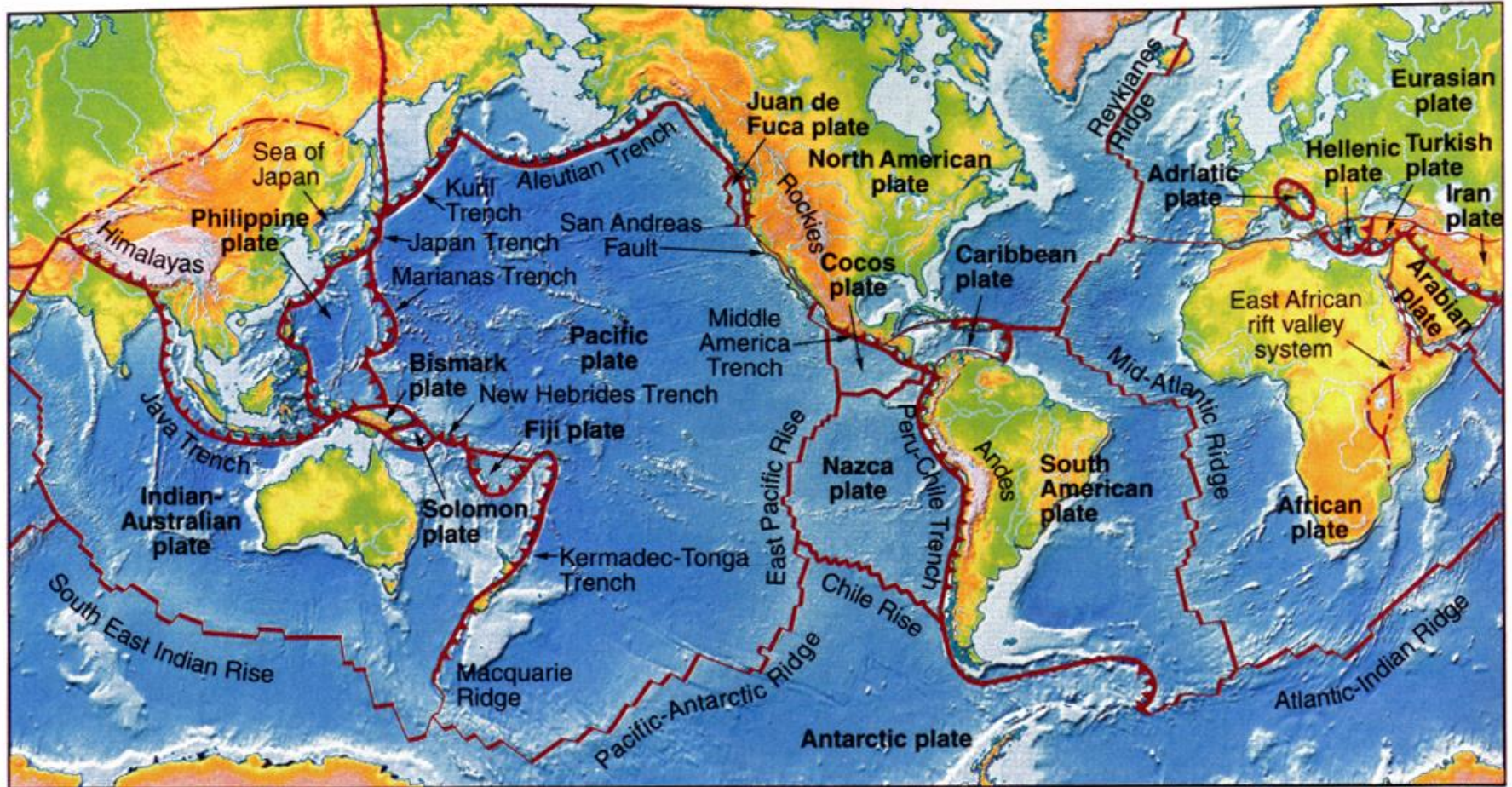
# Transform Boundaries

- Where plates slide past each other



Above: View of the San Andreas transform fault





— Ridge axis  
divergent boundary

— Transform

▲ Subduction zone  
Convergent boundary

--- Zones of Extension within continents

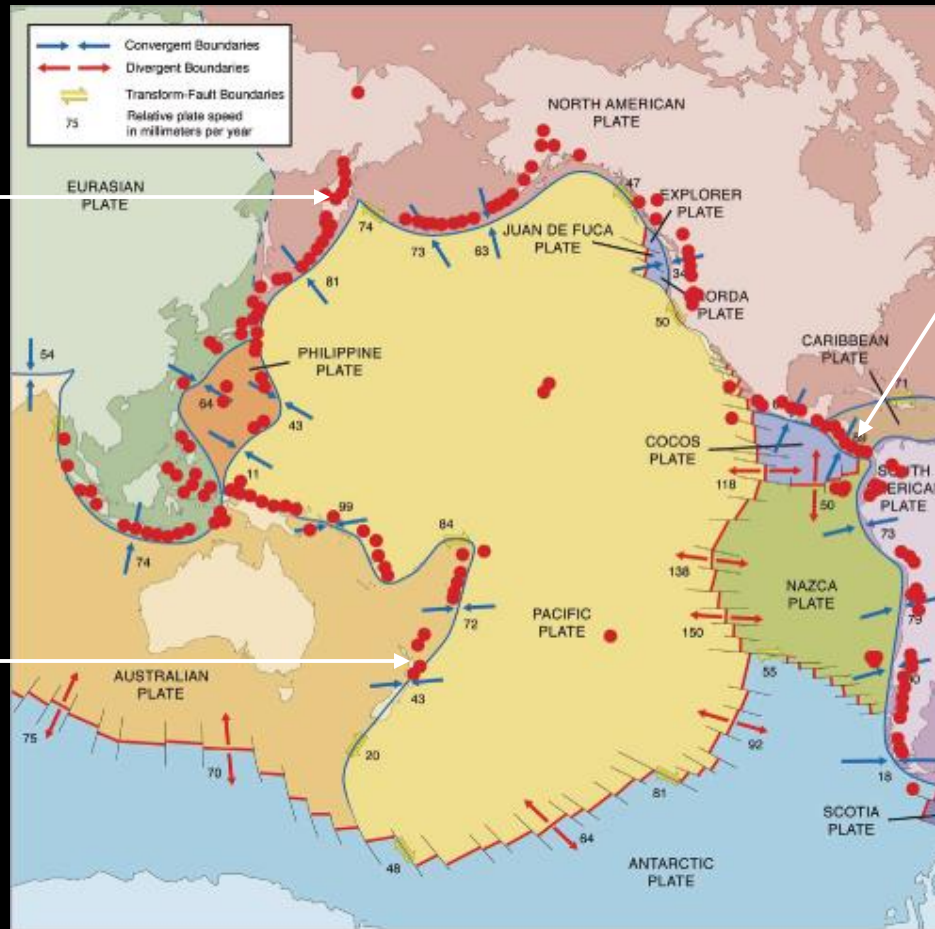
--- Uncertain plate boundary

# Earth Plate

# Volcanoes and Plate Tectonics...

...what's the connection?

# Pacific Ring of Fire

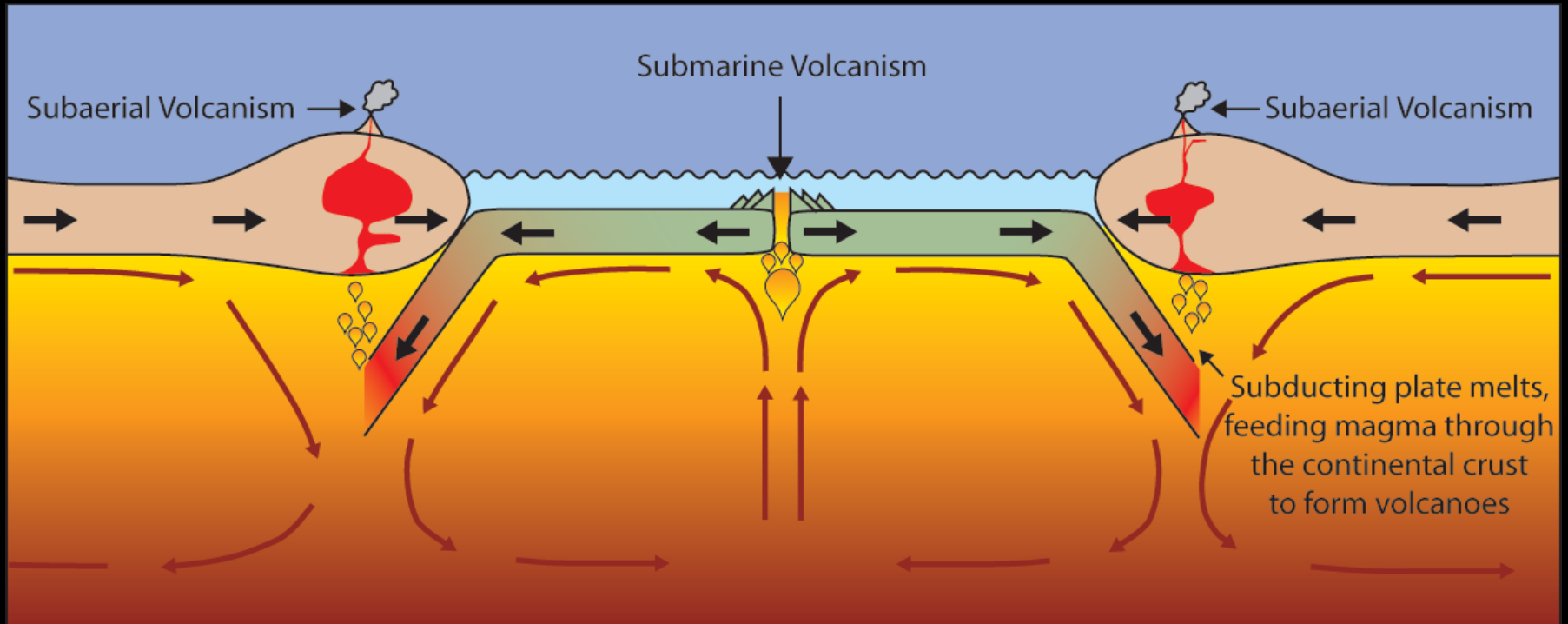


Volcanism is mostly focused at plate margins

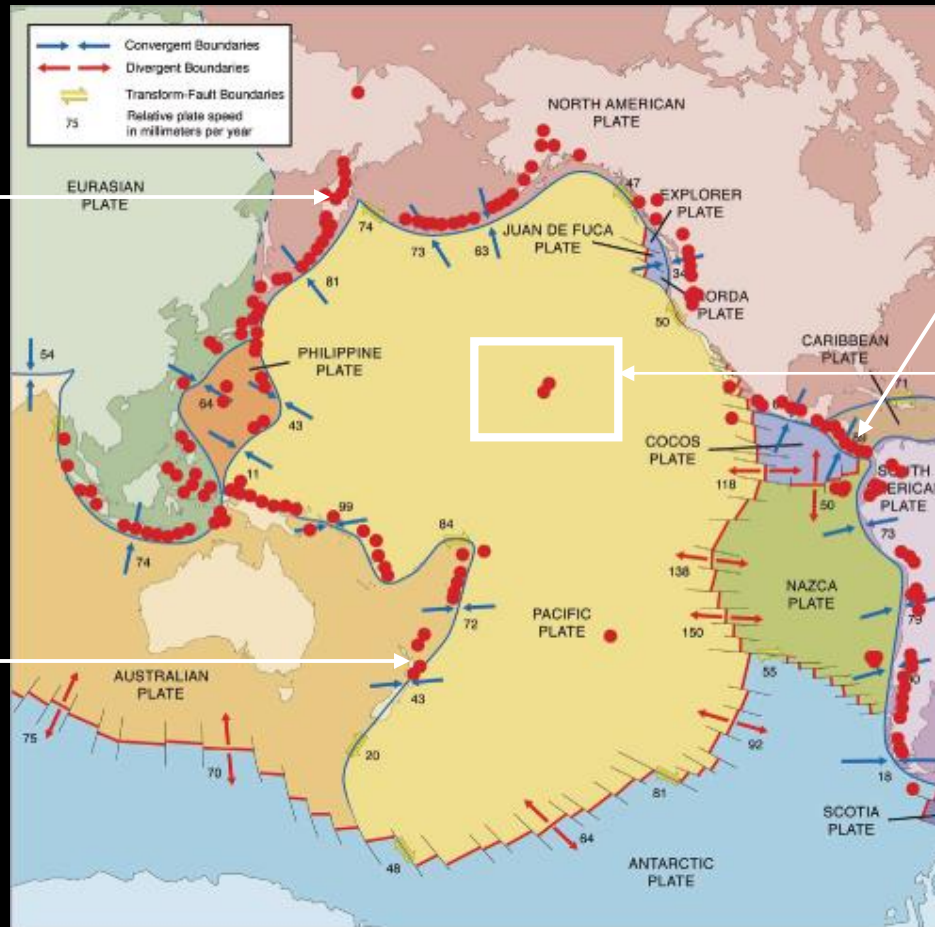


# Volcanoes are formed by:

- Subduction
- Rifting
- Hotspots



# Pacific Ring of Fire

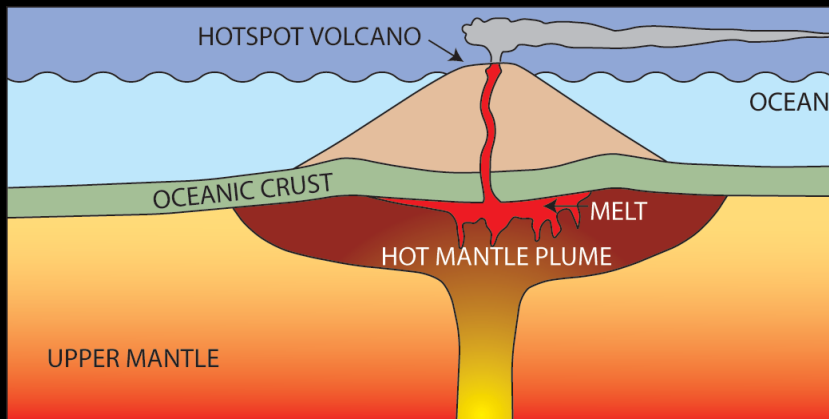


Hotspot volcanoes



# What are Hotspot Volcanoes?

- Hot mantle plumes breaching the surface in the middle of a tectonic plate

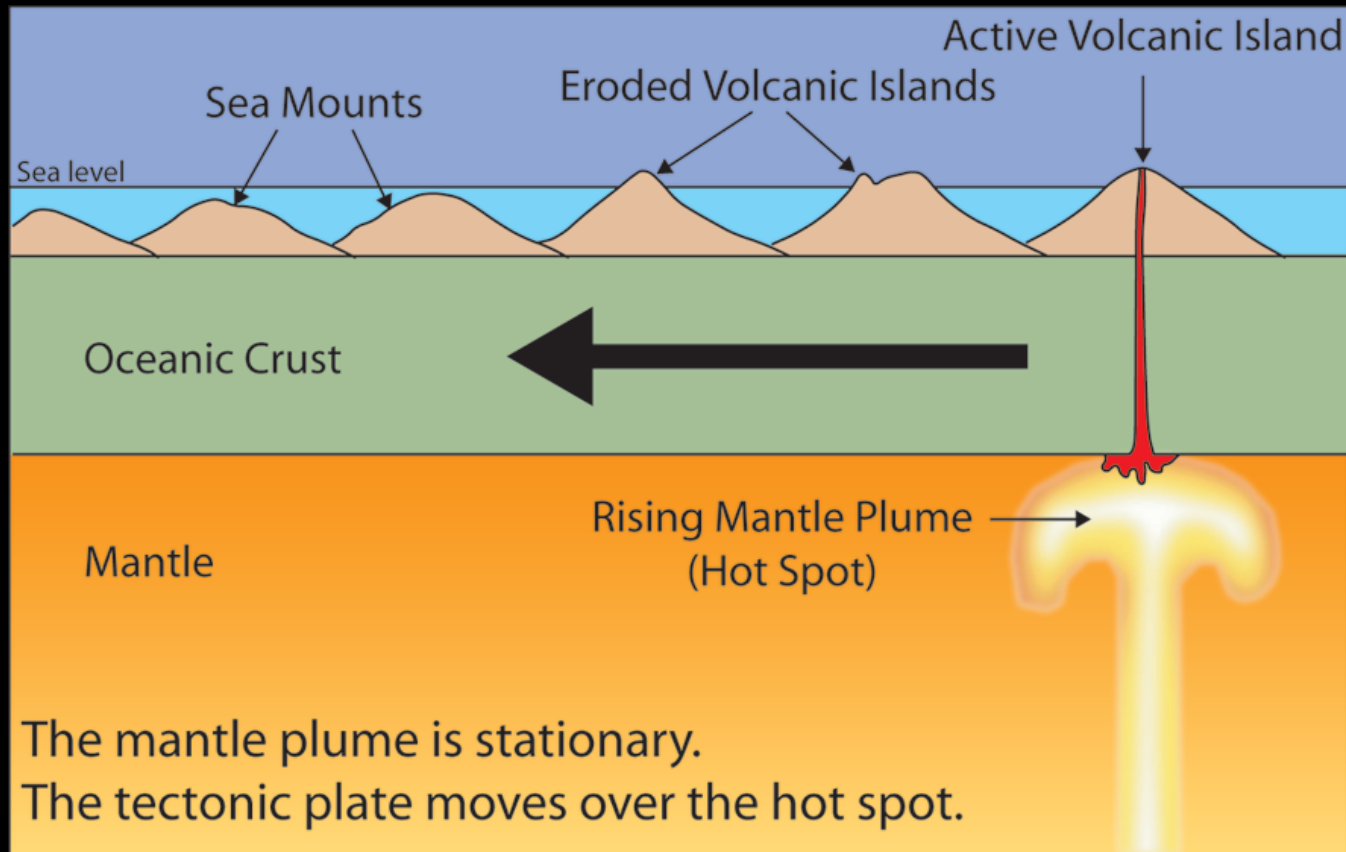


The Hawaiian island chain are examples of hotspot volcanoes.



Photo: Tom Pfeiffer / [www.volcanodiscovery.com](http://www.volcanodiscovery.com)

The tectonic plate moves over a fixed hotspot forming a chain of volcanoes.



The volcanoes get younger from one end to the other.

# Earthquakes and Plate Tectonics...

...what's the connection?



- As with volcanoes, earthquakes are **not** randomly distributed over the globe

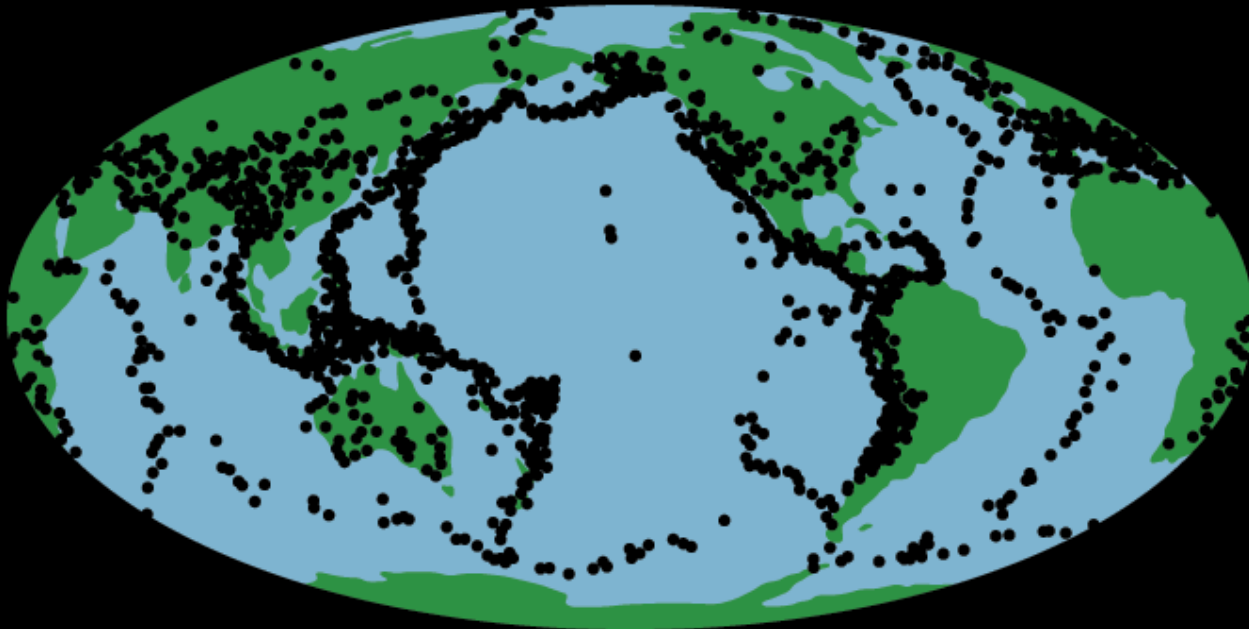


Figure showing the distribution of earthquakes around the globe

- At the boundaries between plates, friction causes them to stick together. When built up energy causes them to break, earthquakes occur.

# Where do earthquakes form?

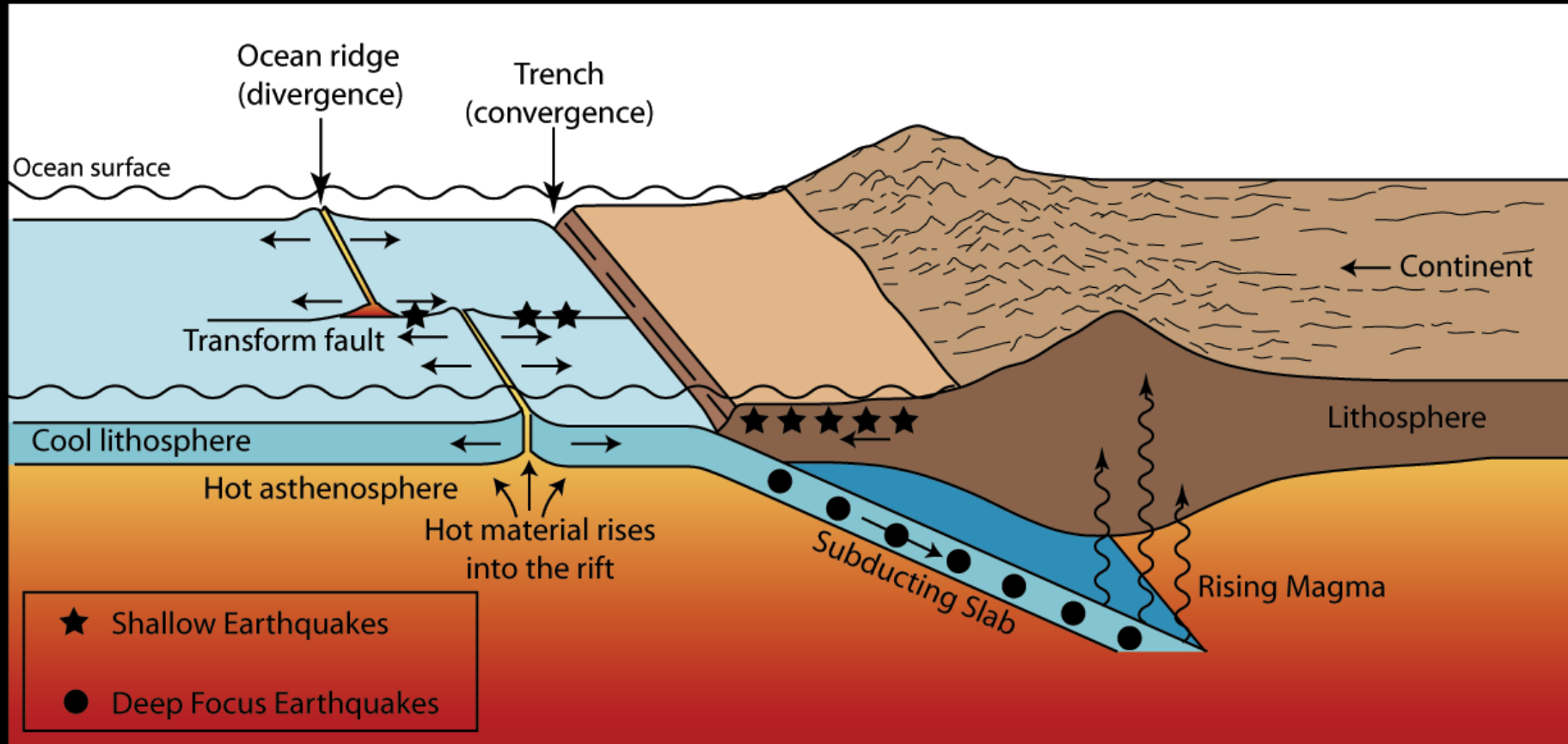


Figure showing the tectonic setting of earthquakes

# Plate Tectonics Summary

- The Earth is made up of 3 main layers (core, mantle, crust)
- On the surface of the Earth are tectonic plates that slowly move around the globe
- Plates are made of crust and upper mantle (lithosphere)
- There are 2 types of plate
- There are 3 types of plate boundaries
- Volcanoes and Earthquakes are closely linked to the margins of the tectonic plates

# THANK YOU

God Bless! Stay Safe !

Ashlin Ellan

Subject Teacher & Examiner