A Level geography Revision lesson

REVISION SESSION – WHAT HAVE WE LEARNT SO FAR?

Learning objective:

To review our learning so far and identify gaps in our knowledge

LINKS TO SPEC

1. Concepts of Hazards
2. Plate tectonics
3. Storm Hazards
4. Volcanic Hazards

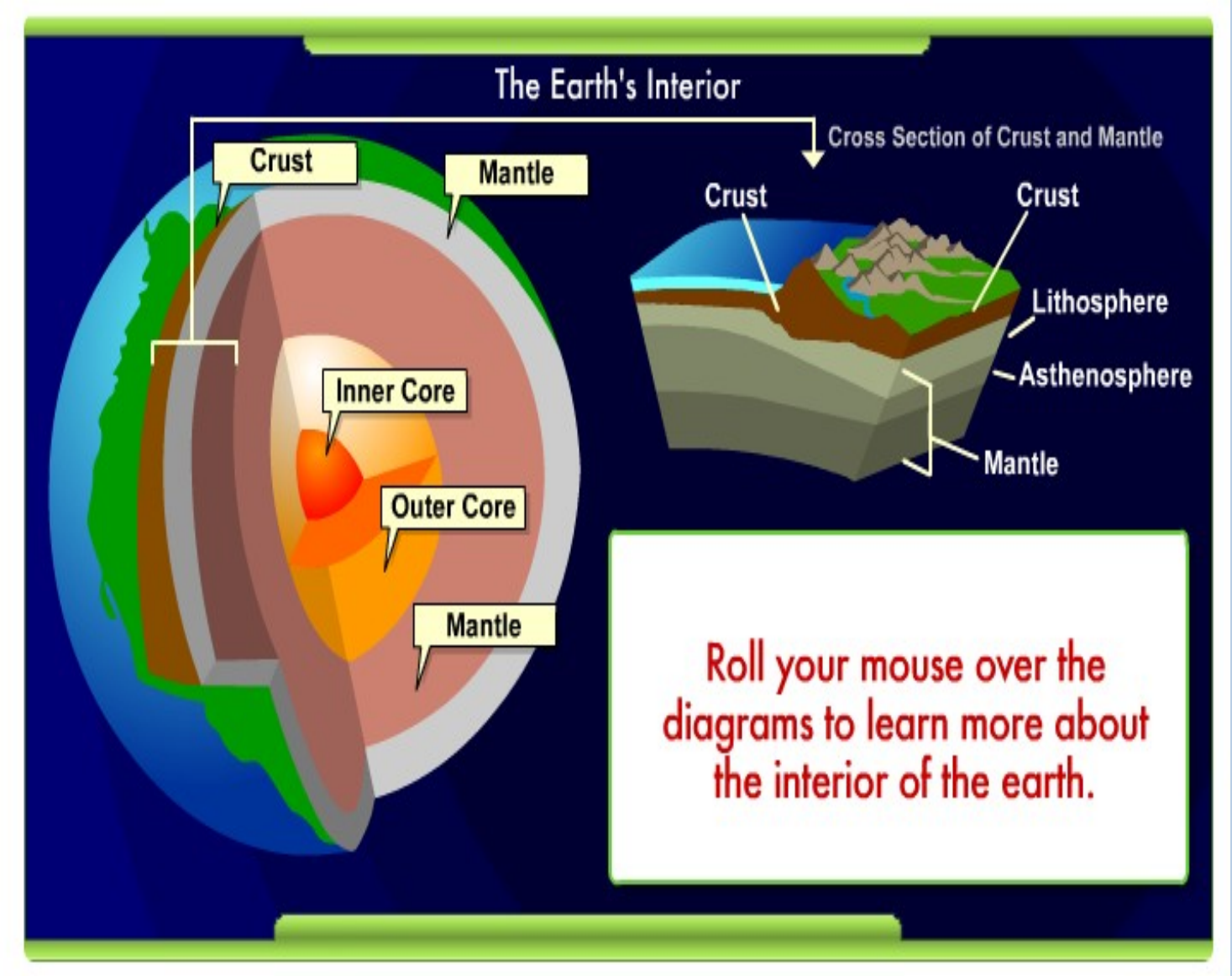
THE BIG PICTURE

Revision session based on lesson so far (Nov 2016)

Plate tectonics

1. Earth structure and internal energy sources.
2. Plate tectonic theory of crustal evolution: tectonic plates; plate movement; gravitational sliding; ridge push, slab pull; convection currents and sea-floor spreading.
3. Destructive, constructive and conservative plate margins.
4. Characteristic processes: seismicity and vulcanicity.
5. Associated landforms: young fold mountains, rift valleys, ocean ridges, deep sea trenches and island arcs, volcanoes.
6. Magma plumes and their relationship to plate movement

Layers of the Earth



Crust Characteristics

Characteristics	Continental Crust	Oceanic Crust
Thickness	6-10 km	30-70 km
Age	Less than 200 million years	Over 1.500 million years
Density	2.6 (lighter)	3.0 (heavier)
Composition	Mainly granite; silicon, aluminium, oxygen (SIAL)	Mainly basalt; silicon, magnesium, oxygen (SIMA)

Plate Tectonics

- This picture shows the plates of the world and the way they are moving.

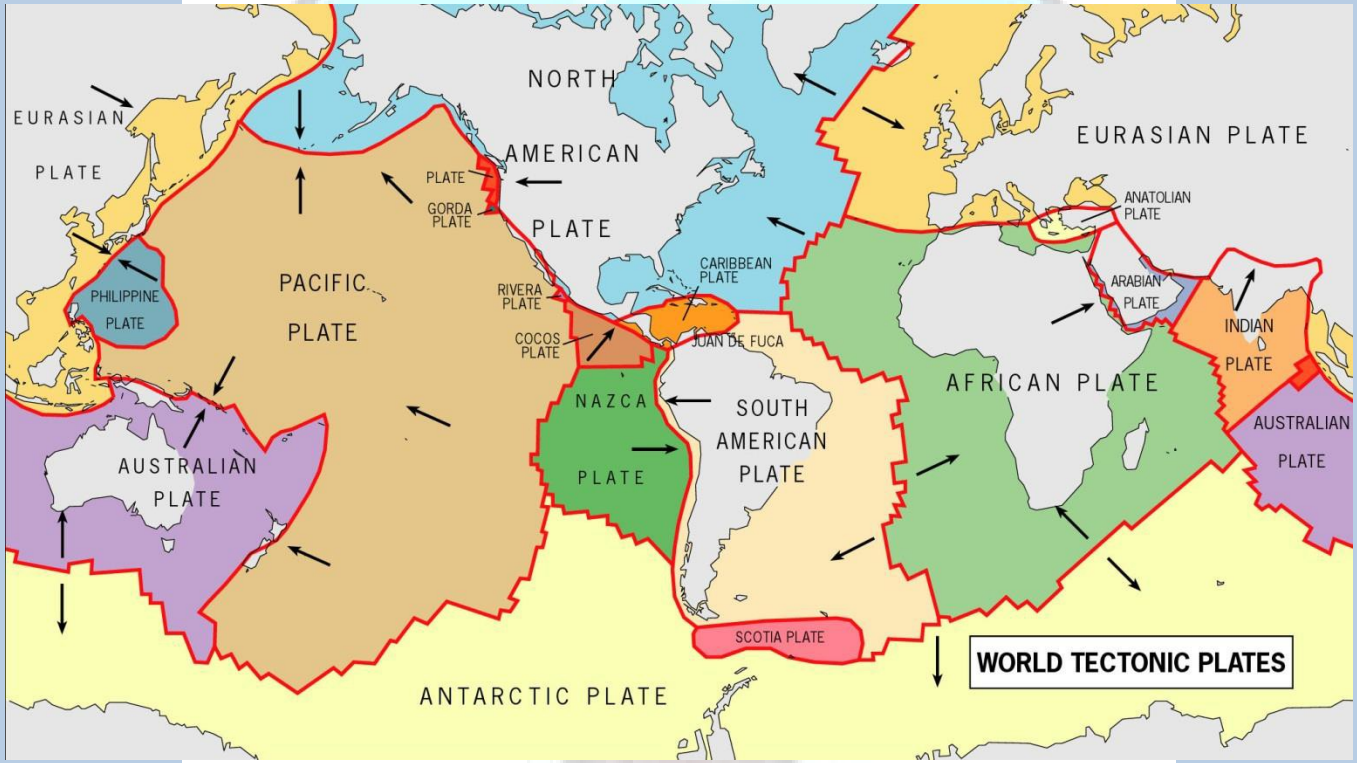


Plate Movement

Convection currents, basal drag and slab suction

The higher temperatures of the earth's core generate zones of hotter, more fluid magma which upwells, with cooler and denser material sinking downward, creating a continuous circulatory motion (mantle convection currents).

These pull the crust apart by **basal drag** (friction) at spreading ridges and rift zones, and pull oceanic crust down in to the mantle (**slab suction**) at subduction zones.

Slab pull

Plate motion is also driven by the weight of cold, dense plates sinking into the mantle at trenches.

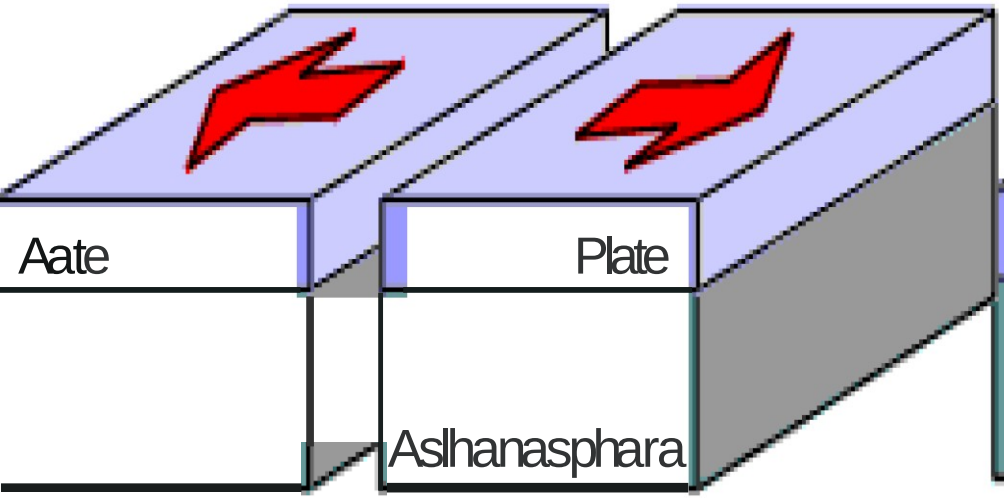
Gravitational sliding (slab push)

As oceanic lithosphere is formed at spreading ridges from hot mantle material, it gradually cools and thickens with age (and thus distance from the ridge). Cool oceanic lithosphere is significantly denser than the hot mantle material from which it is derived and so with increasing thickness it gradually subsides into the mantle, resulting in a slight lateral incline with distance from the ridge.

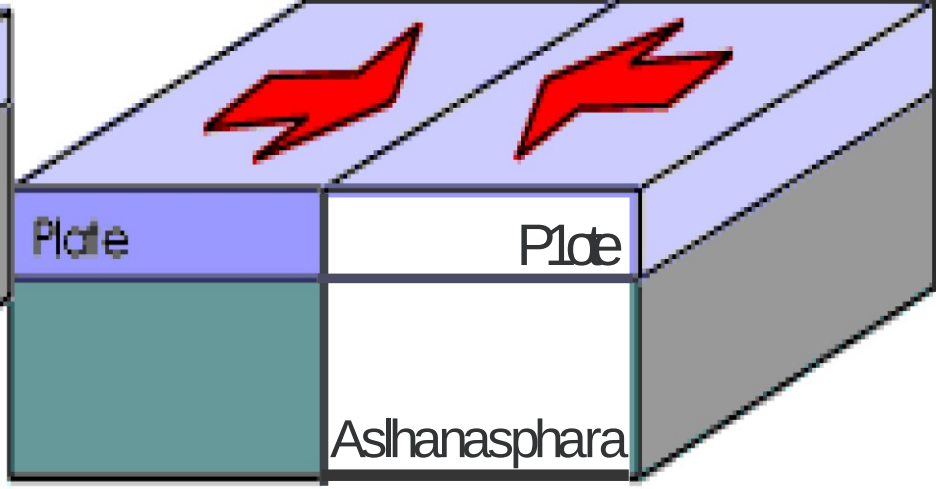
Plume tectonics

This is an alternative theory which suggests that mantle plumes are the major driving force of the earth's plates.

Evidence for Plate Tectonics	Explanation
Continental fit	Jigsaw fit of continental shelves proved that they were once joined together
Fossils	Fossils of similar species are found in South America and South Africa
Climate Zones	Certain places experienced ice ages when their location would deem that impossible
Geology	Rocks of similar composition found in different places. Identical rocks found in opposite locations which means they once formed side by side.



Divergent



Convergent

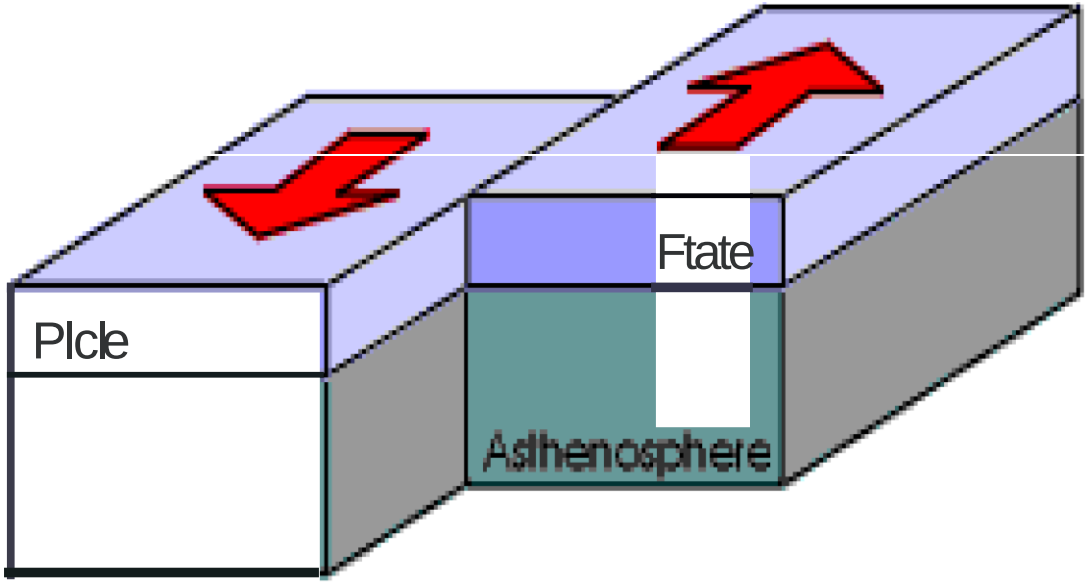


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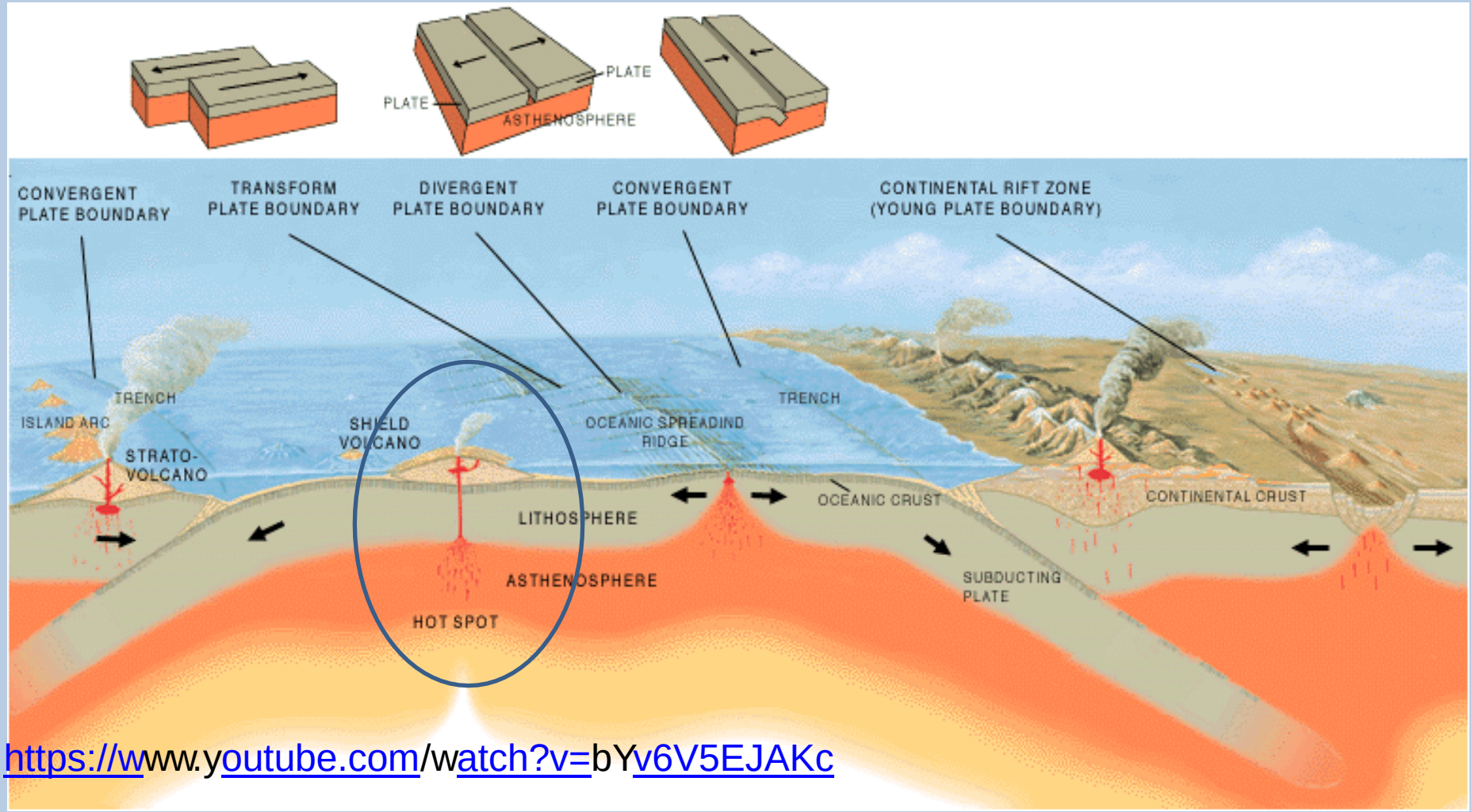
Plate Boundaries and hotspots (or hot plumes)



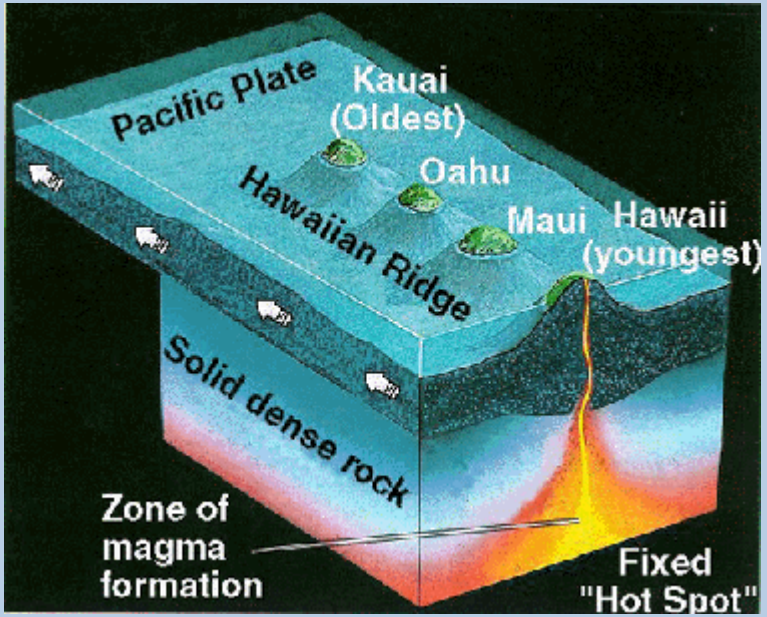
https://www.youtube.com/watch?v=bYv6V5EJAKc

https://www.youtube.com/watch?v=AhSaE0omw9o

Hotspots

Hotspots are volcanic regions fed by unusually hot mantle that is anomalously hot compared to the mantle.

What is a hotspot?



The two theories (hot spots)

- **Tuzo Wilson: Theory in 1963. That a static radioactive element in the mantle which creates plumes of magma. Satellite imagery shows bulges in the earth's crust which shows that there are large plumes of magma near the surface.**
- **ALTERNATIVE**
- **Foulger: 2003 faults in the crust are responsible for allowing the plume of magma through the crust. Weaknesses in tectonic plates responsible for the formation of hotspots.**

Landforms created by tectonic processes

Ocean Trenches are deep water areas that run along a coastline which has a destructive plate margin. They are created by subduction, and mark the point where the Oceanic crust is being pushed under the Oceanic crust. There is often quite a large section of continental crust between this margin and the ocean's edge, and sometimes a volcanic island arc such as Japan or the Aleutian Islands can be found in between the trench and the continental shelf. These are not to be confused with mid ocean ridges, which are long ridges of mountains created by 2 plates moving apart at a constructive plate margin. Where these mountains rise above the level of the sea Islands such as Iceland are formed.

http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Plate%20Tectonics/Plate%20tectonics/Margins%20and%20landforms.htm

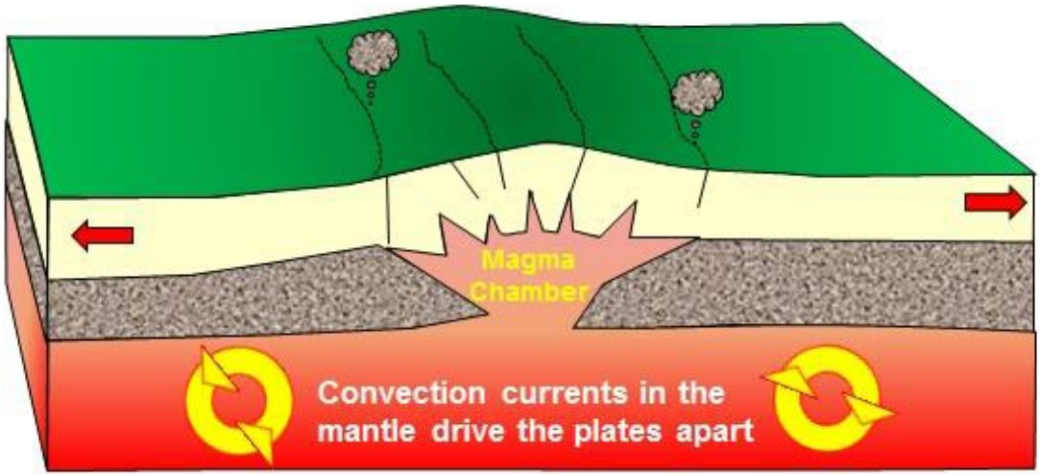
Landforms created by tectonic processes

Fold mountains are large mountain ranges where the layers of rock within them have been crumpled as they have been forced together. They can be formed at destructive or collisional plate boundaries, where tectonic plates are moving together forcing layers of rock to be crumpled upwards. The layers of rock can form 2 basic features, if the folding is up over the feature if known as an anticline, or down over into a syncline. If the folded rocks in an anticline go over the top of themselves we get a feature known as an overfold.

The creation of the African Rift Valle

1. Up warping of the crust takes place as magma rises as plates are driven apart

TensionaJ faults and cracks appear in the surface, allowing out gassing and steam eruptions



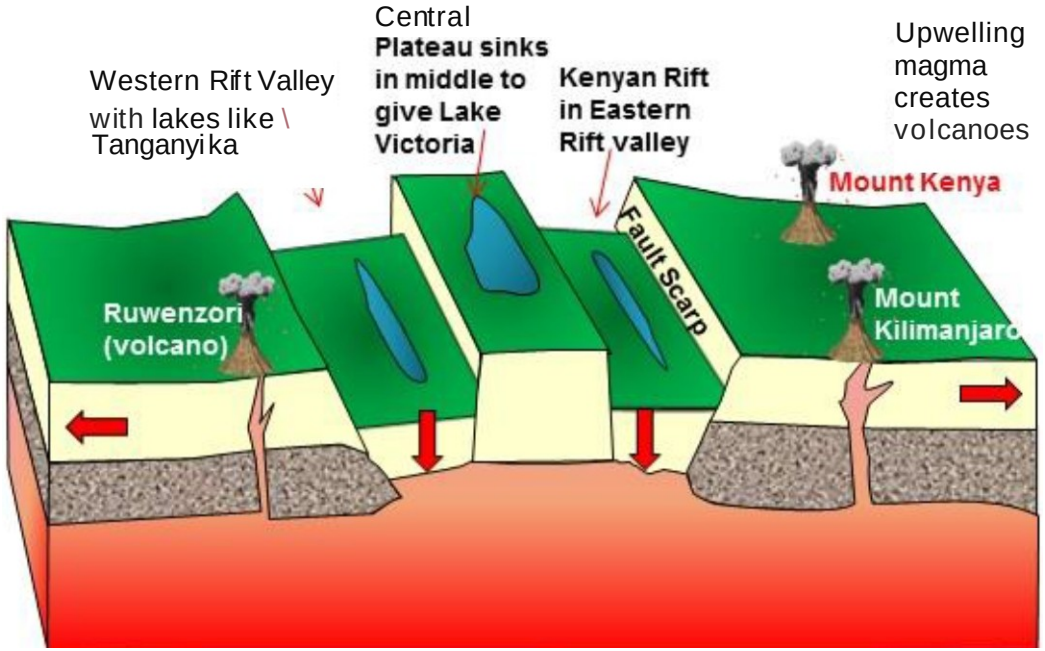
Continental Crust

Asthenosphere

Mantle

2. Plates continue to move apart as a Rift Valley is formed

Huge blocks of crust descend into the Mantle creating the Valleys



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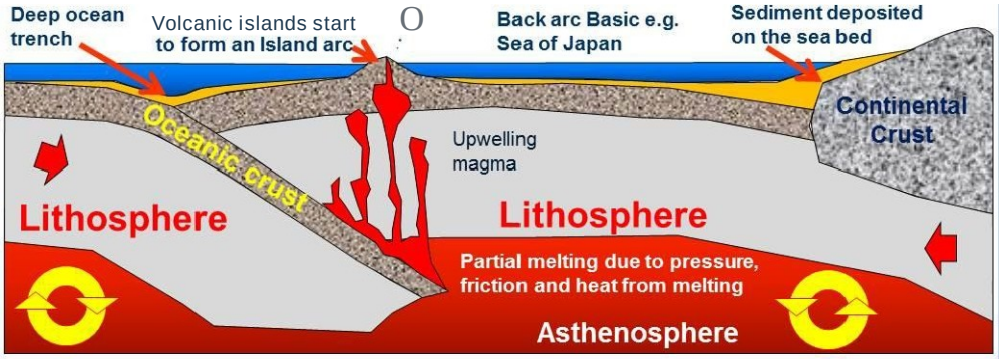
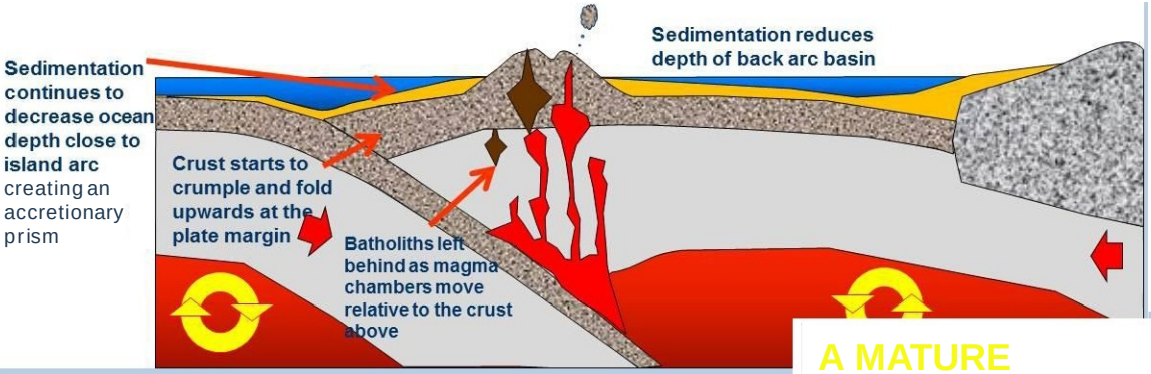
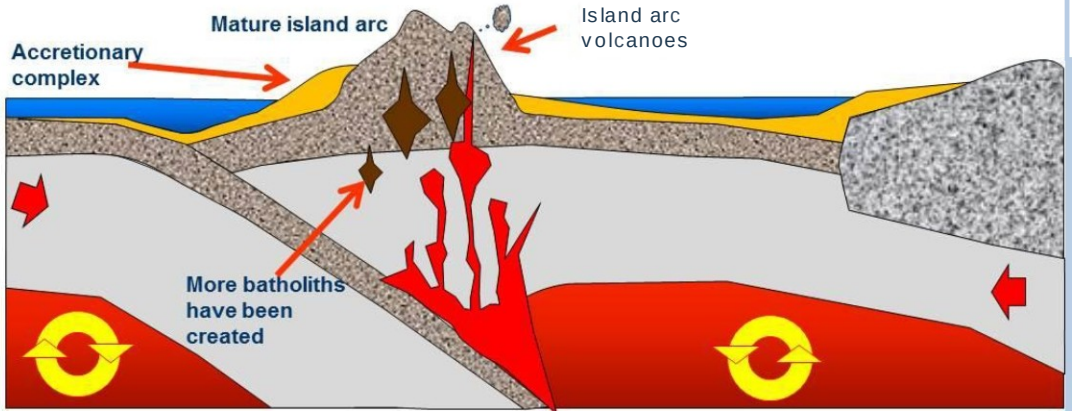
EARLY ISLAND ARC FORMATION



ISLAND ARC DEVELOPMENT

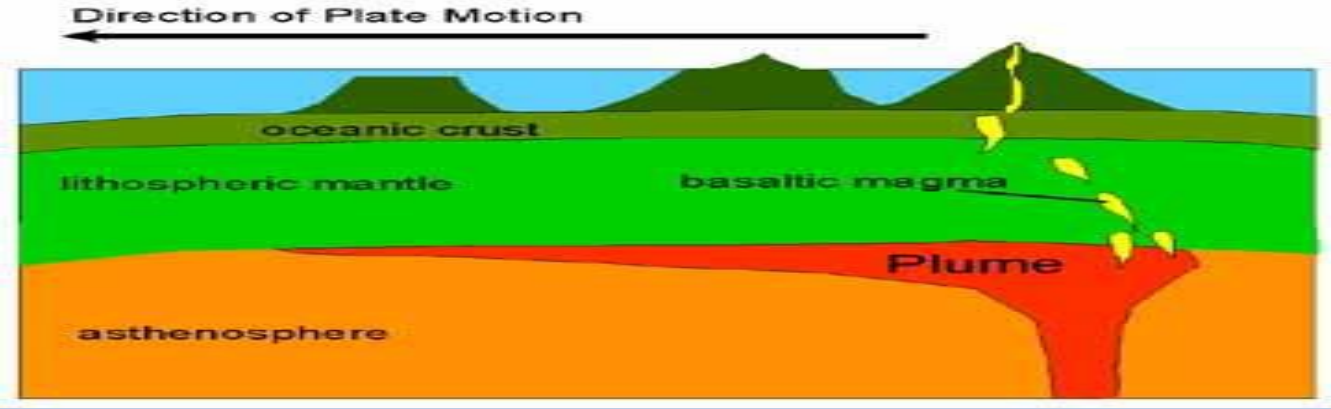


A MATURE ISLAND ARC

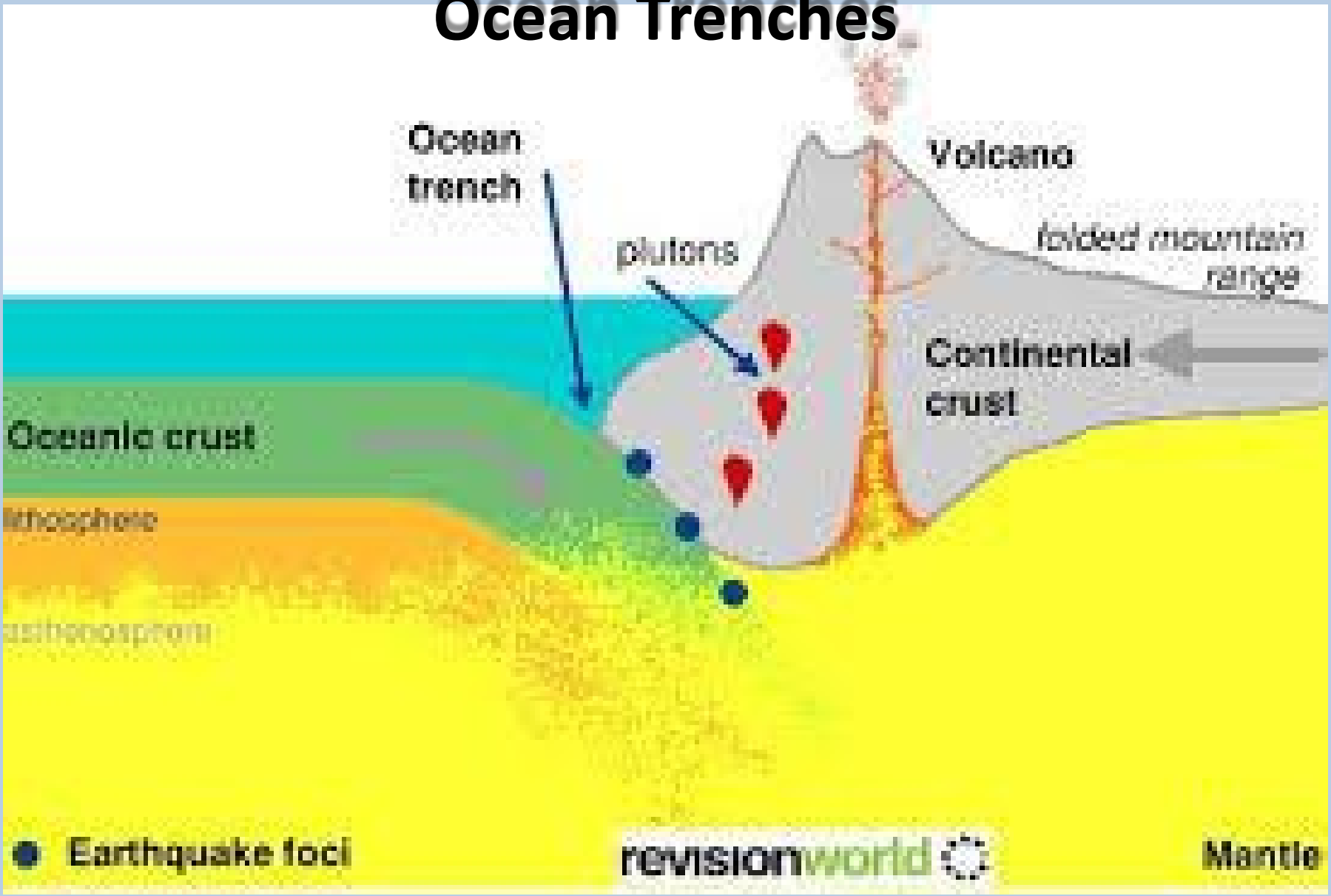


What are mantle plumes?

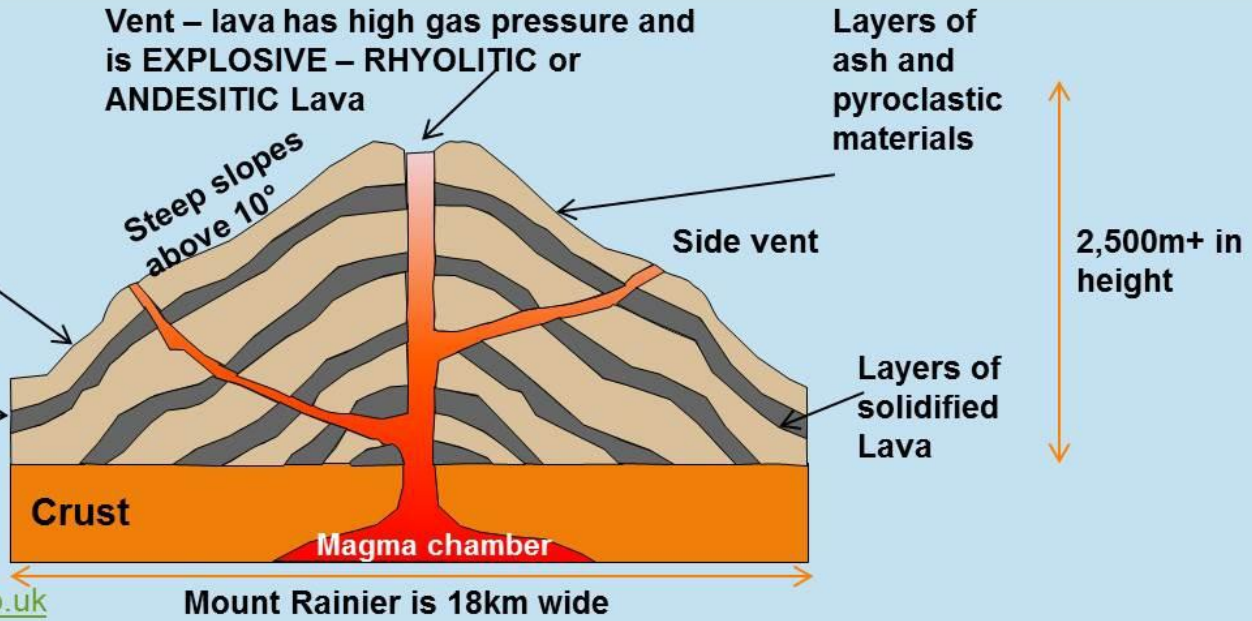
- Stationary, long-lived areas of heat flow within the mantle
- They have a long thin tail and a bulbous head that spreads out at the base of the lithosphere.
- A **HOTSPOT** exists above a magma plume.
- The magma is mafic and produces a shield volcano.



Ocean Trenches

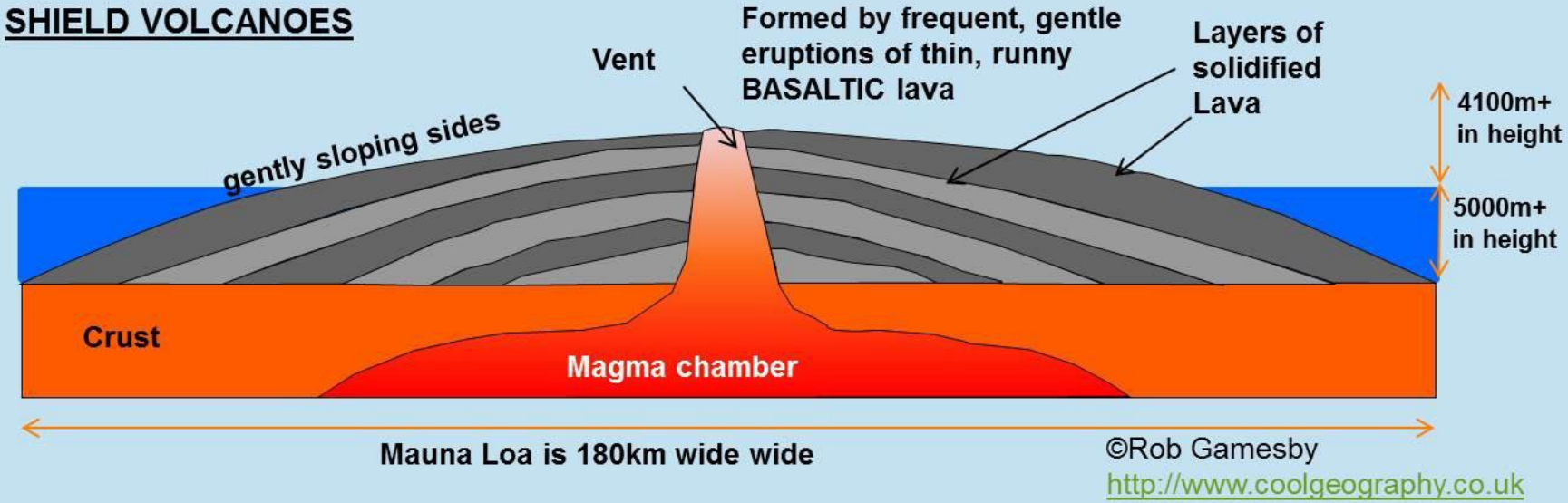


COMPOSITE OR STRATO VOLCANOES



Composite volcanoes are called so because they are COMPOSED of different materials and are usually found at destructive or compressional boundaries.

SHIELD VOLCANOES



Shield volcanoes are usually found at constructive boundaries or over hot spots.