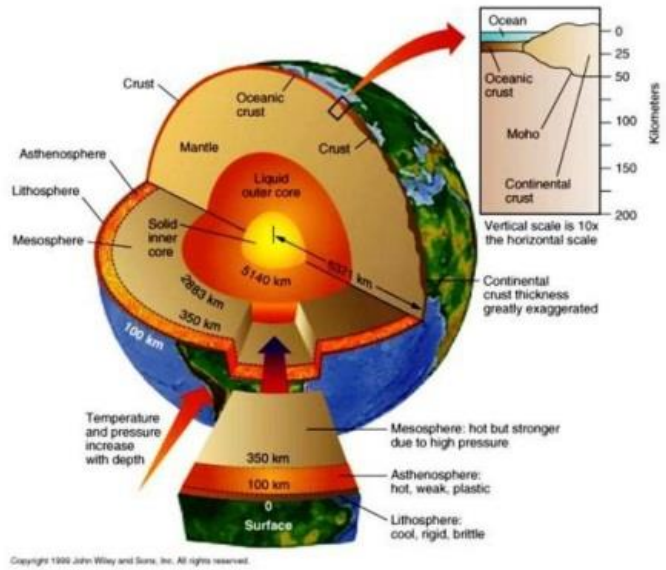


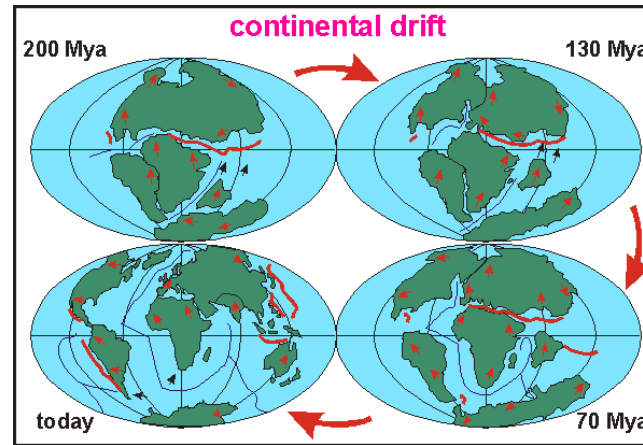
# 12. Can we ever know enough about earthquakes and volcanoes?



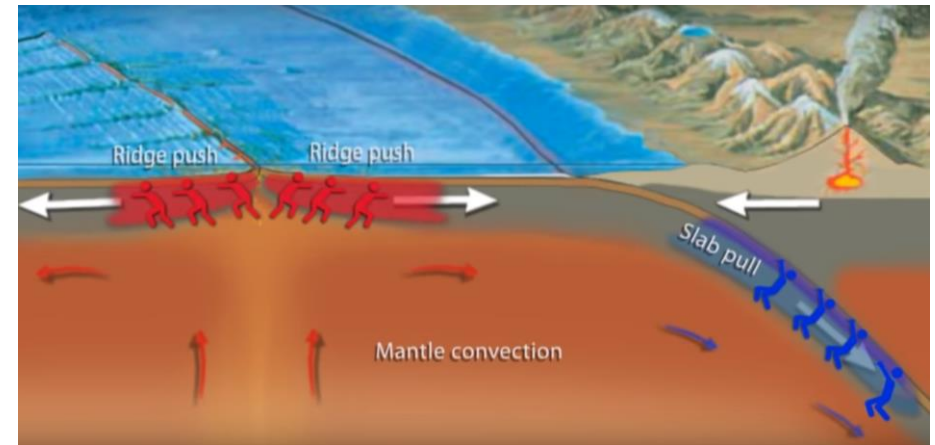
## Structure of the Earth



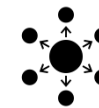
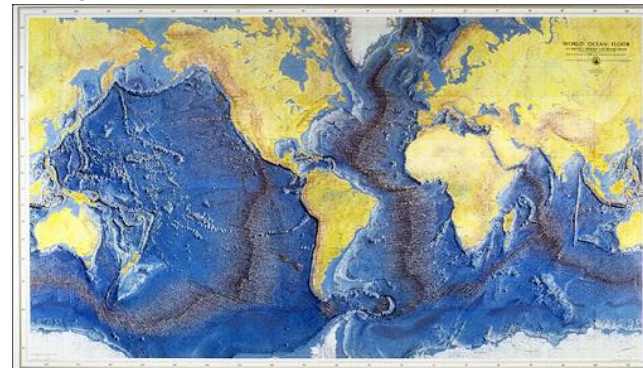

## Plate Tectonic Theory - Wegener



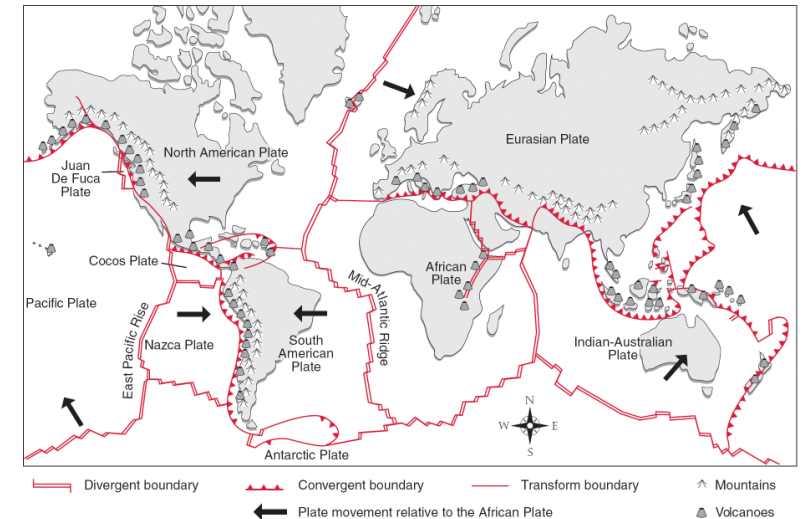

## Plate Movement




## Plate Tectonic Research and Evidence - Marie Tharp & Bruce Heezen



## Distribution - plate boundaries



**Lithosphere**  
Lithos + sphaira  
"rocky" "sphere"  
From the Greek

**Asthenosphere**  
Asthen + spharia  
"weak" "sphere"

## 12. Can we ever know enough about earthquakes and volcanoes?

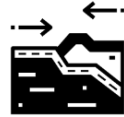
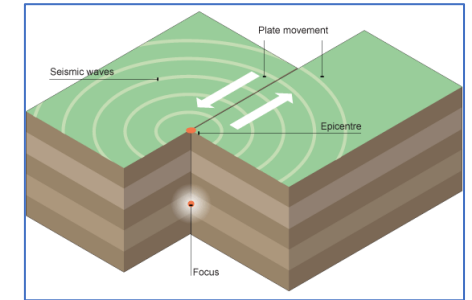
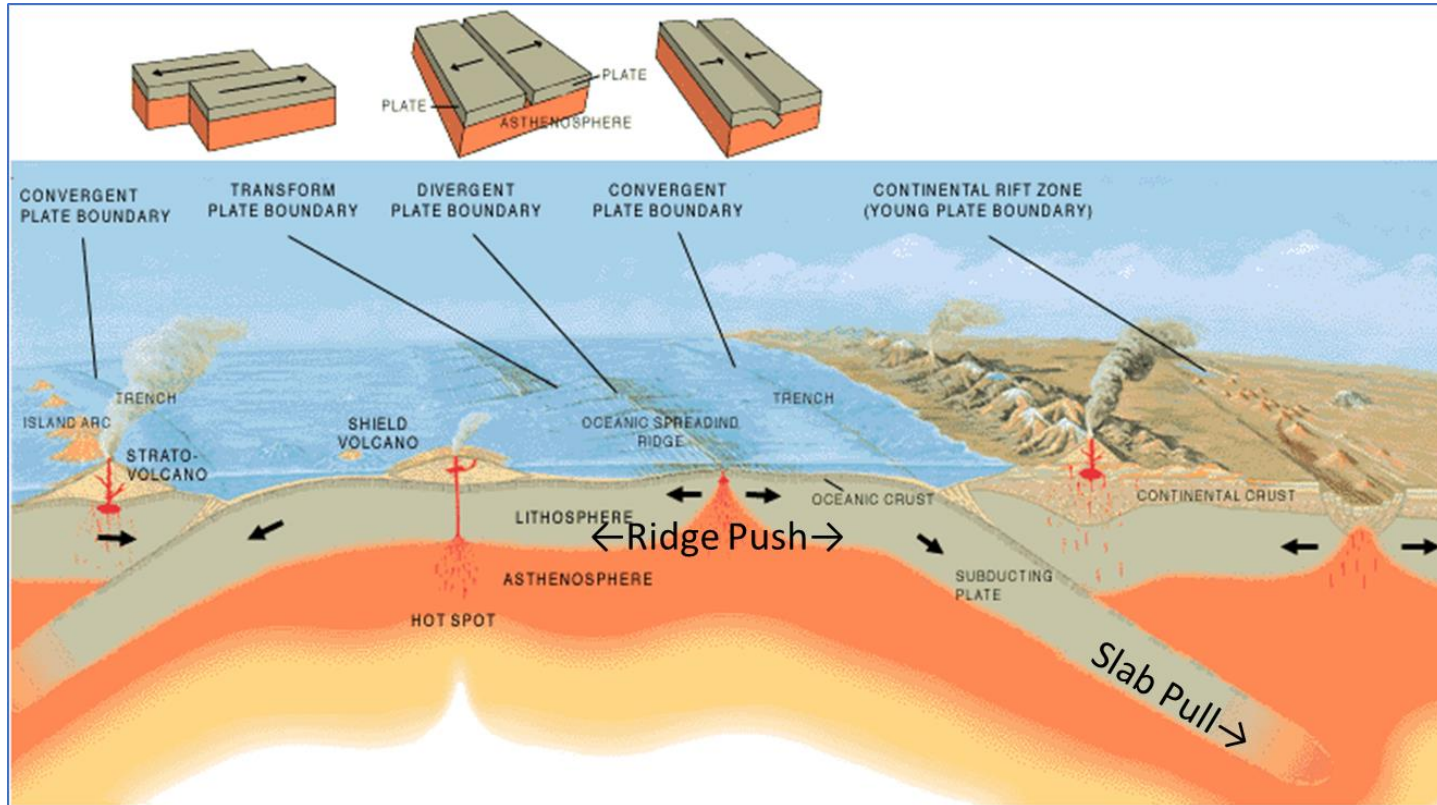


Plate movement and landforms

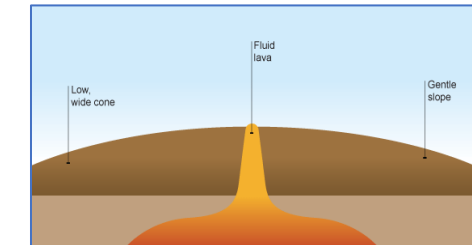


Earthquake

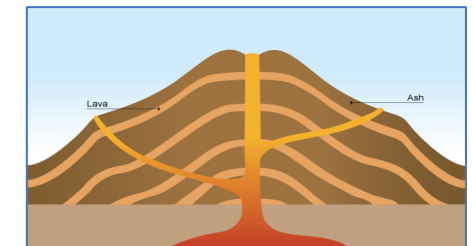
Convergent boundary  
 Divergent boundary  
 Transform boundary  
 Collision boundary  
 Subduction  
 Rift zone  
 Lithosphere  
 Asthenosphere  
 Oceanic crust  
 Continental crust  
 Ridge Push  
 Slab Pull  
 Earthquake  
 Epicentre  
 Focus  
 Seismic Waves  
 Richter Scale  
 Mercalli Scale  
 Magnitude  
 Hot Spot  
 Stratovolcano  
 Composite volcano  
 Shield volcano  
 Magma  
 Lava  
 Pyroclastic flow



Shield volcano



Stratovolcano



### Key Questions

1. What are plate tectonics?
2. How is the Earth's crust broken?
3. What causes plates to move?
4. What are the effects of this movement?
5. How do we know all this?



## Tectonic Case Studies

**EARTHQUAKE** www.internetgeography.net

# Haiti 2010

On January 12th 2010 an earthquake struck 10 miles south-west of the capital city of Haiti, Port au Prince.

magnitude **7.0** 16:53



105K destroyed	316K dead	\$7.9 billion damage	4000 schools damaged/destroyed
188K damaged	300K+ affected	1.5m homeless	1.5m living in temporary housing
30K businesses damaged	Port au Prince port damaged	control tower severely damaged	4 years after 230k in temporary housing
1/5 jobs lost	many countries sent search & rescue teams	gave \$330m World Bank waived debt repayments for 5 yrs	\$1.1 billion charity donations


**EARTHQUAKE** www.internetgeography.net

# Nepal 2015

On Saturday 25th of April 2015 an earthquake struck Nepal. The epicentre was just 60 kilometres north-west from the capital Kathmandu, the capital city of Nepal.

magnitude **7.6** 11:26

Indian plate collides with the Eurasian




600k damaged	8632 dead	\$10 billion damage	landslide killed 250 in the village of Ghodatabela
188K destroyed	19009 homeless	2.8m displaced	
2 large aftershocks 6.6 & 6.7	avalanche at Mount Everest base camp killed 17 people	tourist numbers declined	harvests were lost or damaged
landslides and rock falls	UK provided 100 search and rescue, medics and rescue experts	\$1 billion aid from India and China	\$73m UK \$200m ADB 1st phase rehabilitation

**EARTHQUAKE** www.internetgeography.net

# Japan 2011

An earthquake struck on March 11th 2011 off Japan's north-east coast, about 250 miles (400km) from Tokyo at a depth of 20 miles.

magnitude **9.1** 14:46



300k destroyed	15891 dead	\$300 billion damage	tsunami 6-38m high
1m damaged	6023 missing	333k temp accommodation	10km inland
561 km <sup>2</sup> flooded	Sendai ports and airports damaged	Fukushima nuclear power plant radioactive material released	4 years after 230k in temporary housing
coastline dropped by 60cm	self-defence forces responded	motorway repaired after 4 days	new early warning system
4.4m without	UK sent SAR	Japanese received \$1b donations	