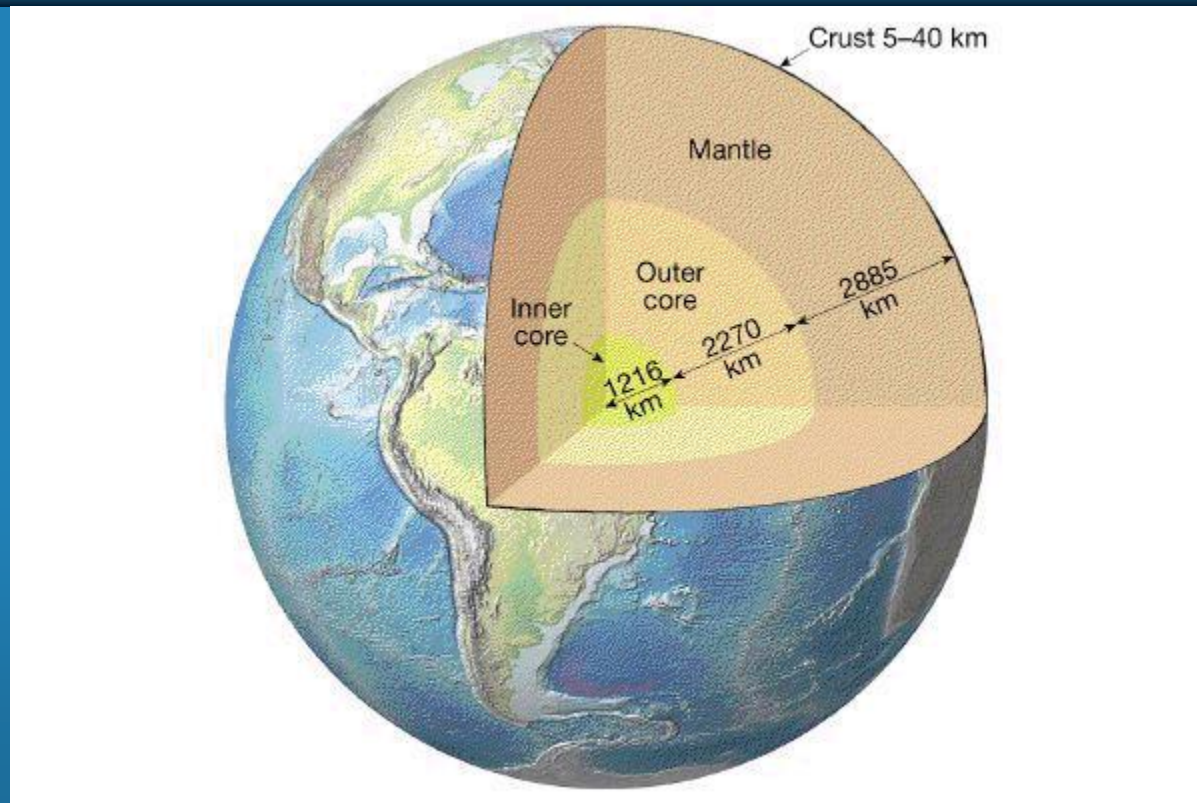


# 7-1 Inside the Earth



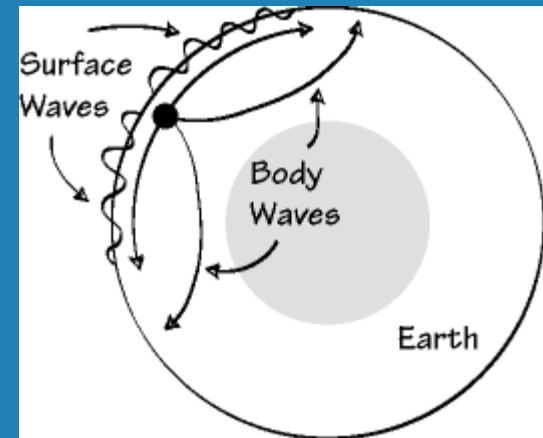


## Did you know....

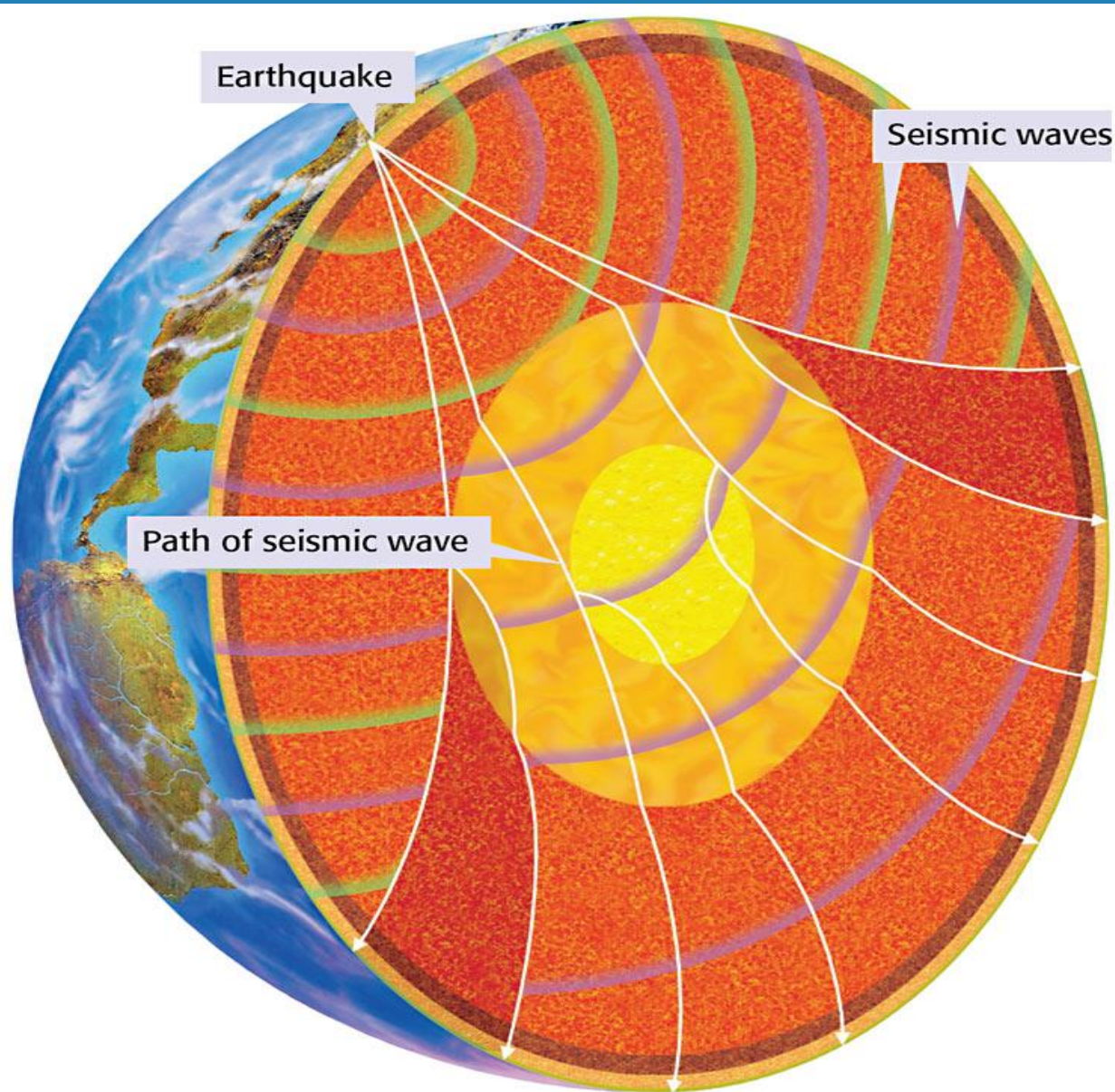
- **The deepest hole ever drilled was in Russia. It was about 12 km deep**
- **(Mt. Everest is about 9 km high).**

# Finding Indirect Evidence

- So if we've only drilled into the crust, how do we know about the mantle and core?
- Geologists use **seismic (earthquake) waves** and study **volcanoes**.



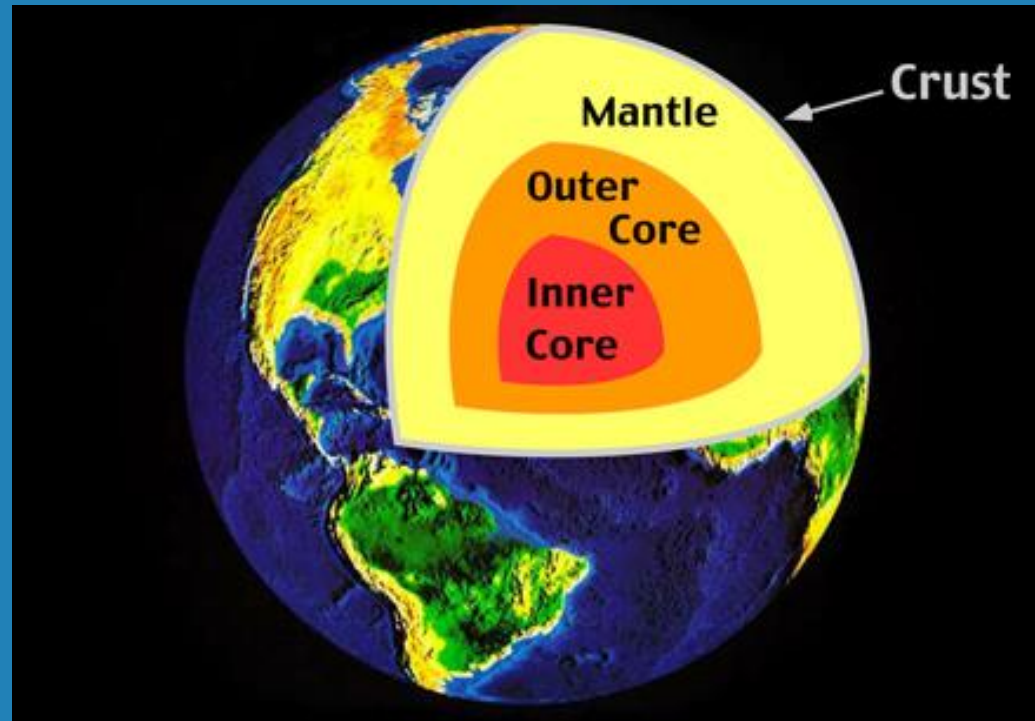
# How seismic waves move through the earth:



- 
- **Note: temperature AND pressure **increases** as you go deeper into the earth**

# 4 layers

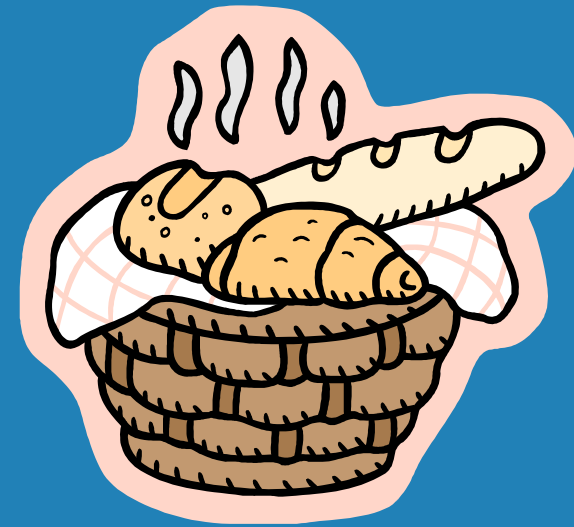
- **1. Crust**
- **2. Mantle**
- **3. Outer Core**
- **4. Inner Core**



# CRUST (rocks, mountains, soil)

## --outer skin of EARTH--

- **thinnest layer**
- **thinnest under ocean**  
**(5km)**
- **thickest under mountains**  
**(100km)**
- **Temperature: 0-1000 °C**
- **less than 1% of earth's mass**

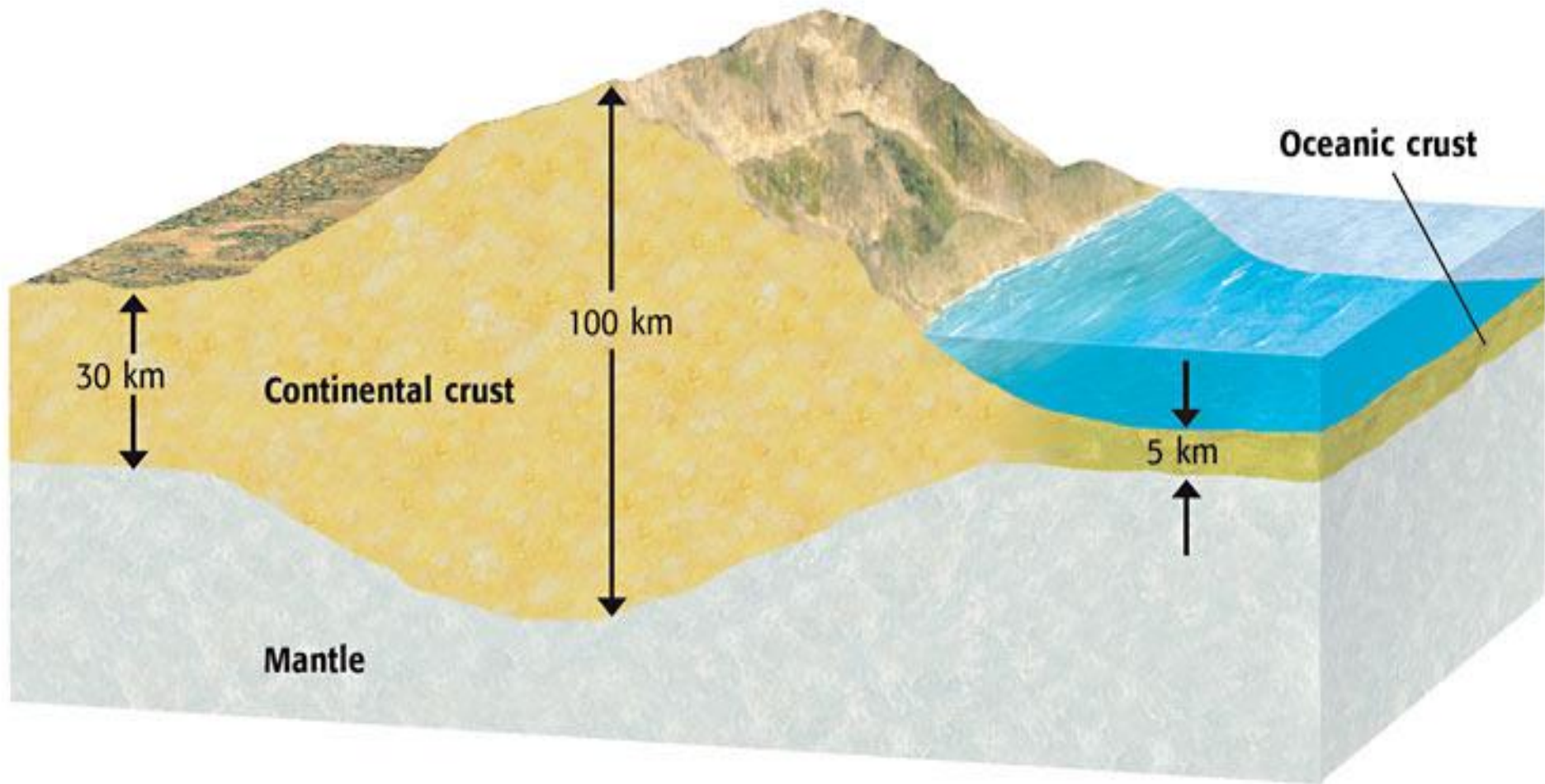


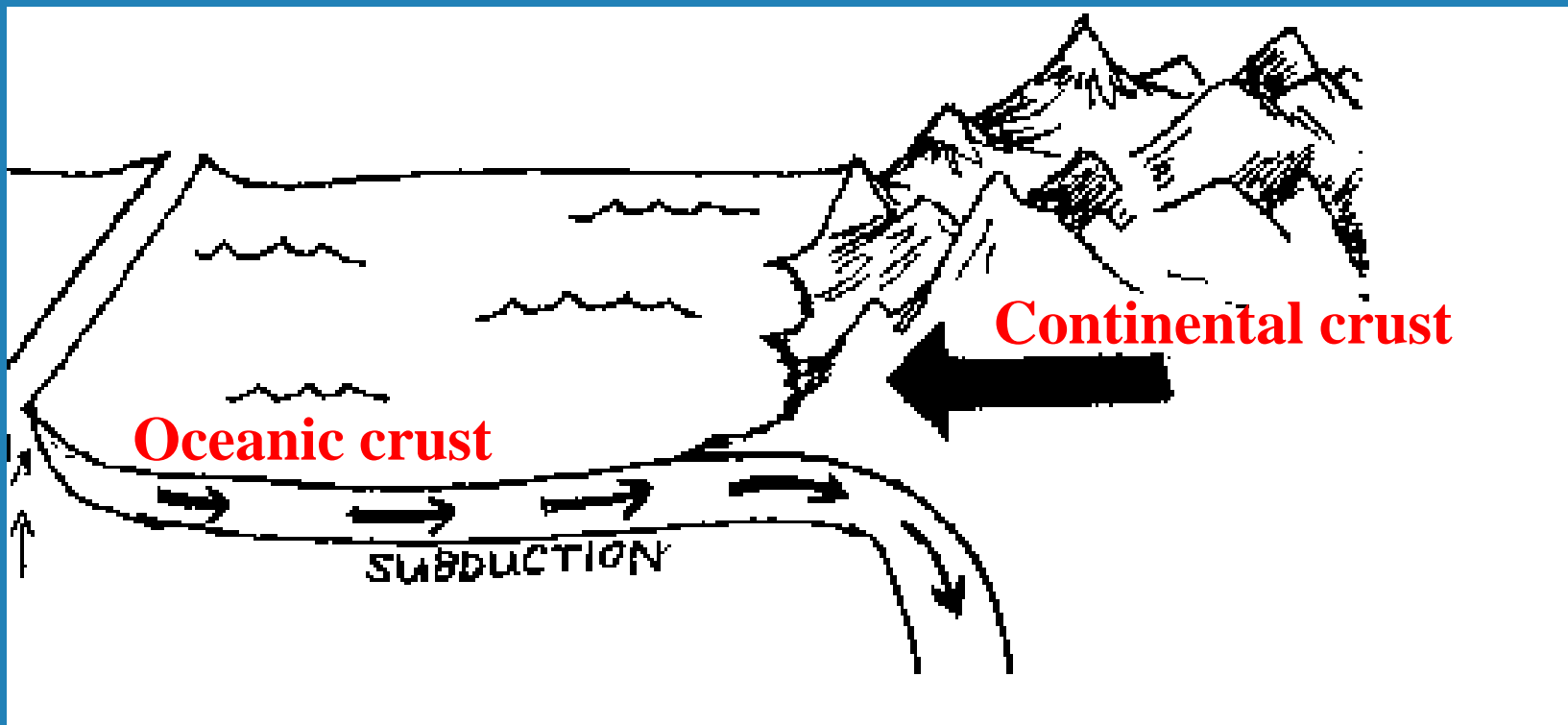
# Two Types of Crust

- **look at samples**
  - oceanic basalt **(denser)**
  - continental granite



# Crust and Upper Mantle







# Mantle (hot/bendable rock)

- **about 3,000 km thick (thickest layer)**
- **makes up most of Earth's mass (67%)**
- **more dense than crust (because more magnesium)**
- **1000-3700 °C**
  
- **Note for later: very top of mantle is solid**

# Inner layer--the CORE

- (a little smaller than the moon)
- made of mostly **iron** and some **nickel** (very dense metals)
- 10-15% of Earth's volume
- about 30% Earth's mass



# 2 parts of the core:

## □ 1. Outer Core

- thick liquid metal because it's so hot
- 3700-5000 °C
- thickness= 2250 km

## □ 2. Inner Core

- SOLID metal due to pressure
- 5000-7000 °C
- radius= 1200 km

# Questions:

- --list the layers in order of density and temperature (lowest to highest)
  - **crust, mantle, core**
- --list the layers in order of size (thinnest to thickest)
  - **crust, inner core, outer core, mantle**
- --Which layer(s) can support life?
  - **crust**

# Facts to ponder:



- If you drove a car 100 kph (62 mph) from the earth's surface to the center of the earth:
  - 1/2 hour to drive through continental **crust**
  - 29 hours to drive through **mantle**
  - about 35 hours to drive through the **core**

# Other facts to ponder:

- mantle makes up 80% of Earth's total volume
- pressure at center may be 1 million times greater than air pressure at sea level
- density compare to water
  - crust=**2.5-3.0** times more dense
  - mantle=**3.3-5.5** times
  - core is **10-13** times



- 
- **So what does this have to do with plate tectonics?**

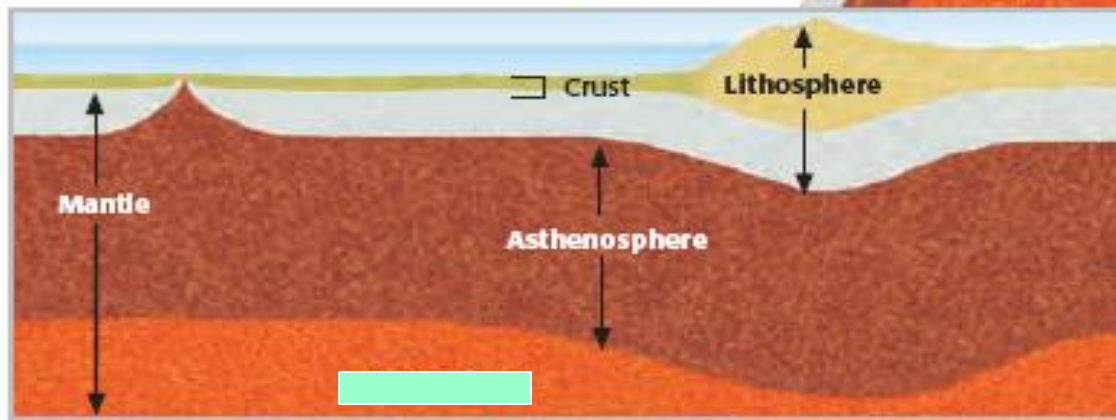
## 2 parts of the earth

1.

**Lithosphere** The outermost, rigid layer of the Earth is the **lithosphere**. The lithosphere is made of two parts—the crust and the rigid upper part of the mantle. The lithosphere is divided into pieces called *tectonic plates*.

2.

**Asthenosphere** The **asthenosphere** is a plastic layer of the mantle on which pieces of the lithosphere move. The asthenosphere is made of solid rock that flows very slowly.



# Another way to divide the earth:

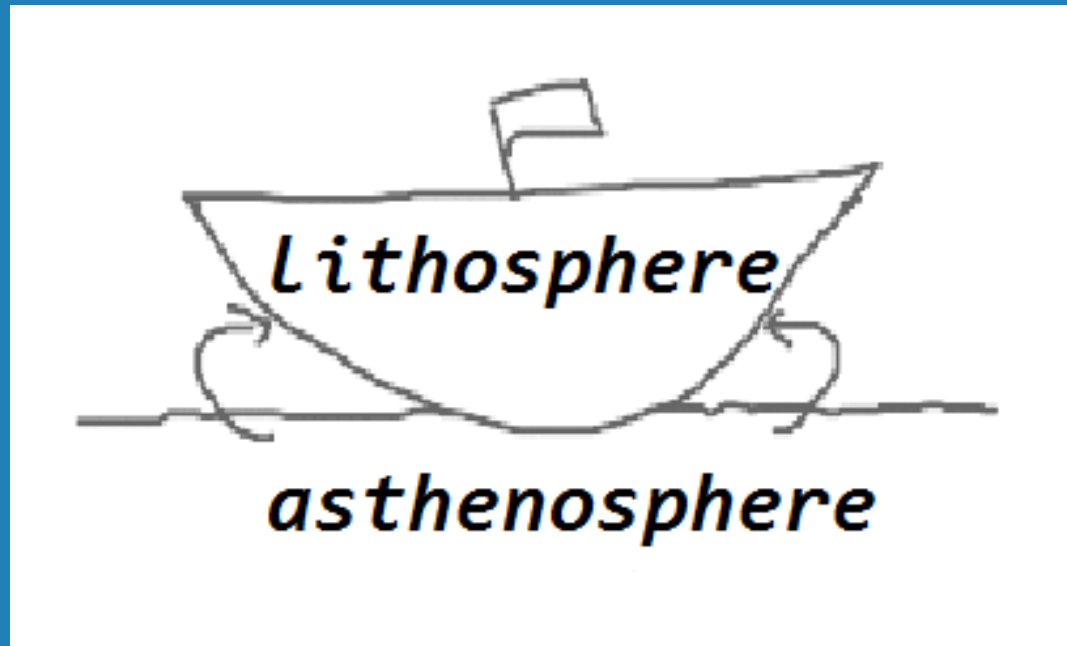
## □ **Lithosphere**

- (*litho* means “rock”)
- solid/rigid outer part of earth
- made of crust and rigid upper part of the mantle
- About 100 km thick
- broken into pieces called **TECTONIC PLATES**

## □ **Asthenosphere**

- the soft layer of the mantle (like a hot plastic)
- made of solid rock that moves very slowly
- tectonic plates move in this soft layer

- lithosphere FLOATS on asthenosphere



# 3 types of heat transfer

## 1. RADIATION

- heat (from sun) can travel through empty space

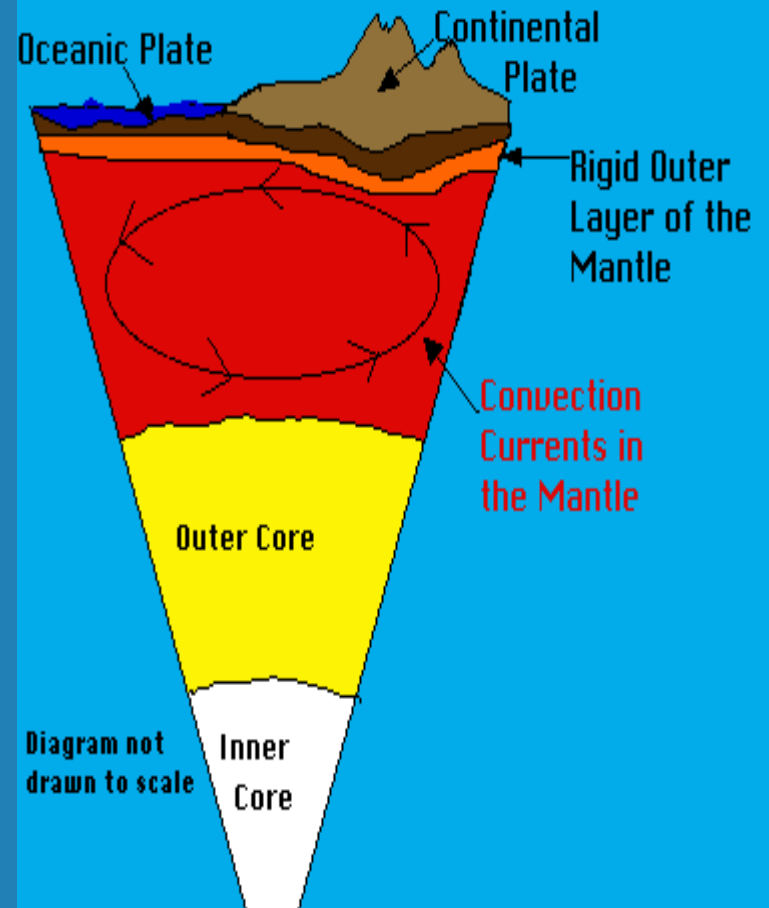
## 2. CONDUCTION --through touching

## 3. CONVECTION\*

- heat moves through fluids (liquids/gases)
- warm (less dense) rises
- cold (more dense) sinks

# Convection Currents

- heat comes from the **core**
- The heat rises to create currents due to density differences





# Questions:

- List the 4 layers of Earth in order (beginning with the surface).
- **crust, mantle, outer core, inner core**
- In general, how does the density of material in Earth's layers change with depth?
- **density increases with depth**



In Earth's crust, what type of rock is found under the ocean?

**basalt**

The thickest layer of the Earth is the

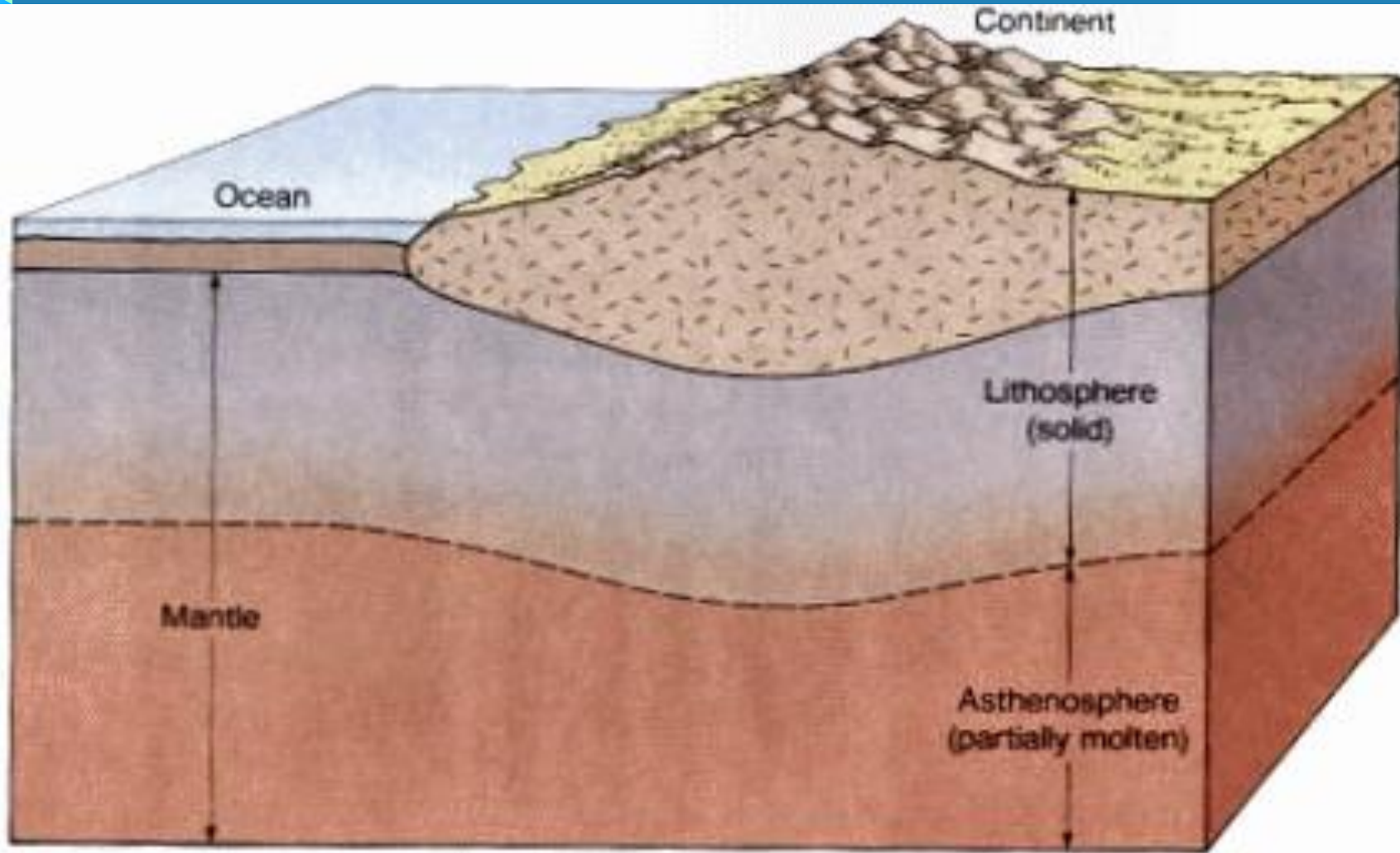
**mantle**

In what state/phase is the Earth's INNER core?

**solid**



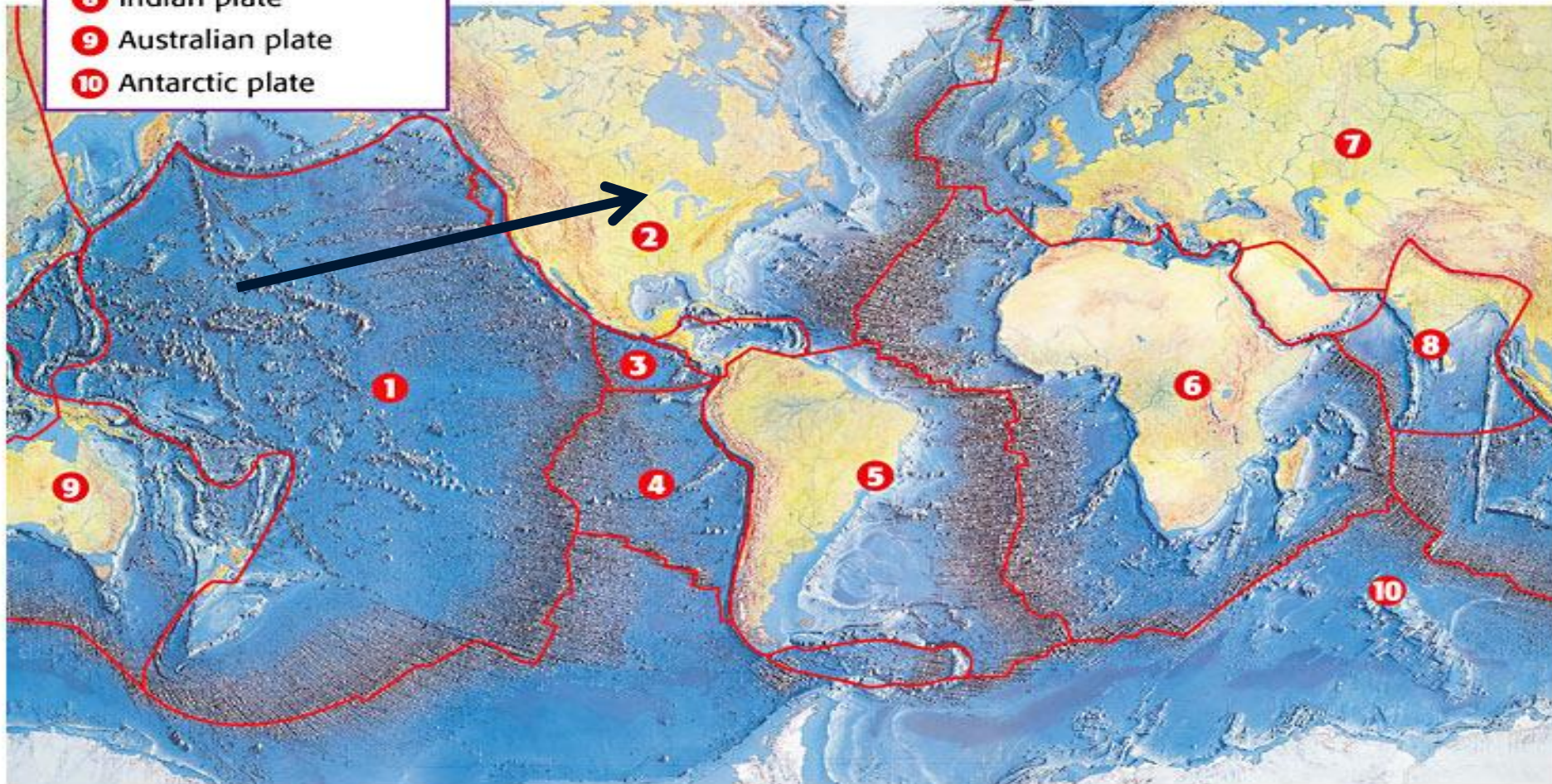
# Lithosphere vs Asthenosphere



## Major Tectonic Plates

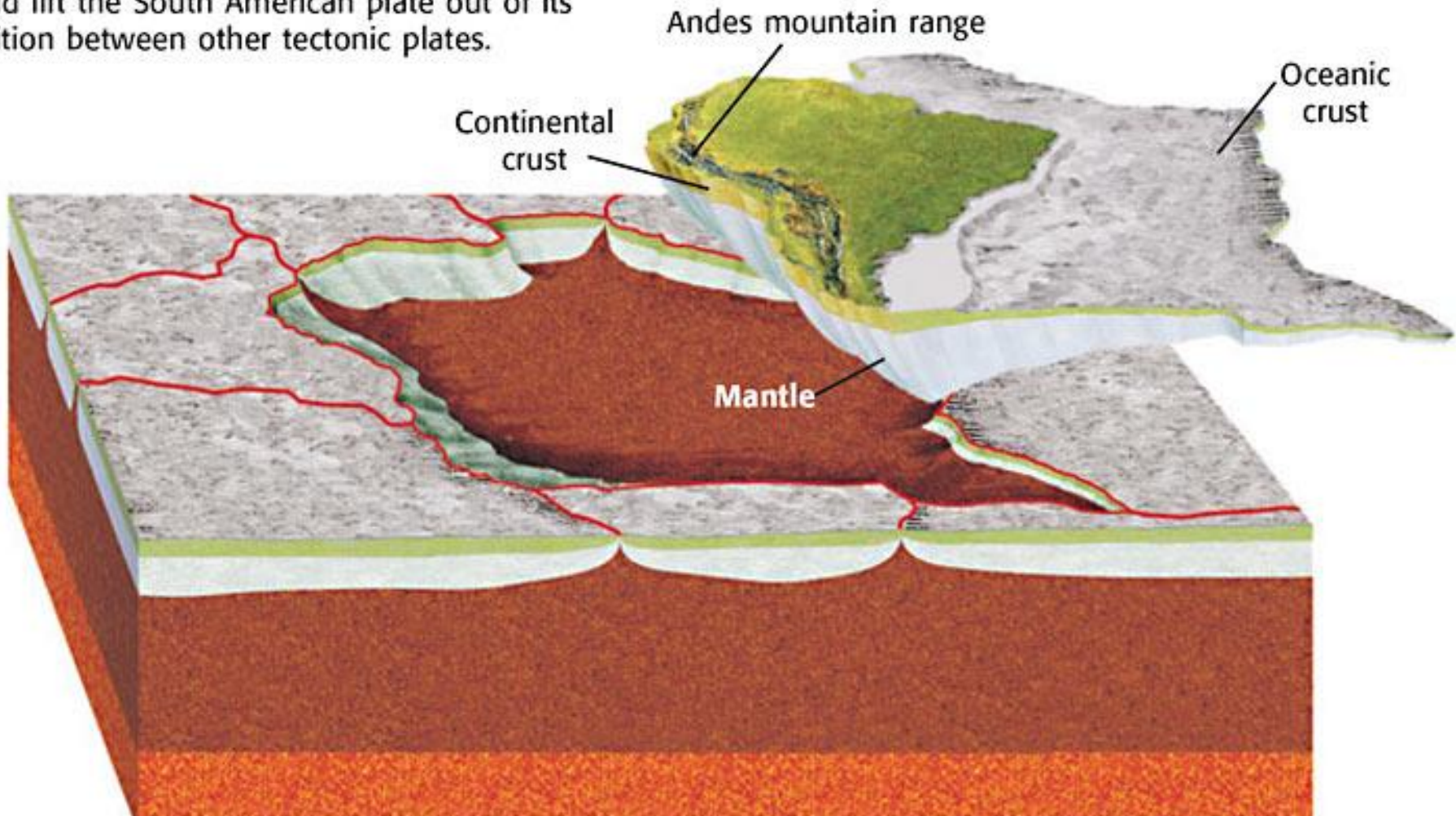
- 1 Pacific plate
- 2 North American plate
- 3 Cocos plate
- 4 Nazca plate
- 5 South American plate
- 6 African plate
- 7 Eurasian plate
- 8 Indian plate
- 9 Australian plate
- 10 Antarctic plate

**Lithosphere divided into 10 major tectonic plates—**  
**know the continental ones**  
**and the Pacific plate!**

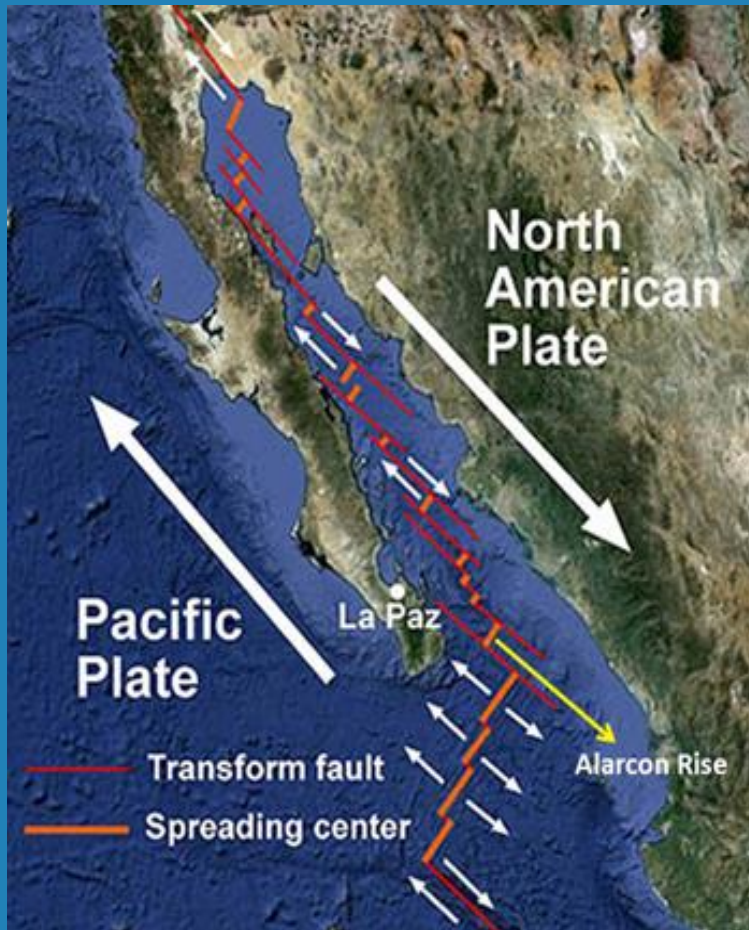


# Tectonic plates usually made of oceanic and continental crust

This image shows what you might see if you could lift the South American plate out of its position between other tectonic plates.



# Look at California (on the Pacific Plate)-- plus Google image of San Andres Fault





□ **Use the following link to introduce plate tectonics,**

□ **esp. convection currents (in asthenosphere):**

□ **<http://www.platetectonics.com/book>**



□ Which of the following compositional layers makes up the greatest percentage of Earth's **mass**?

- continental crust
- oceanic crust
- the mantle
- the core