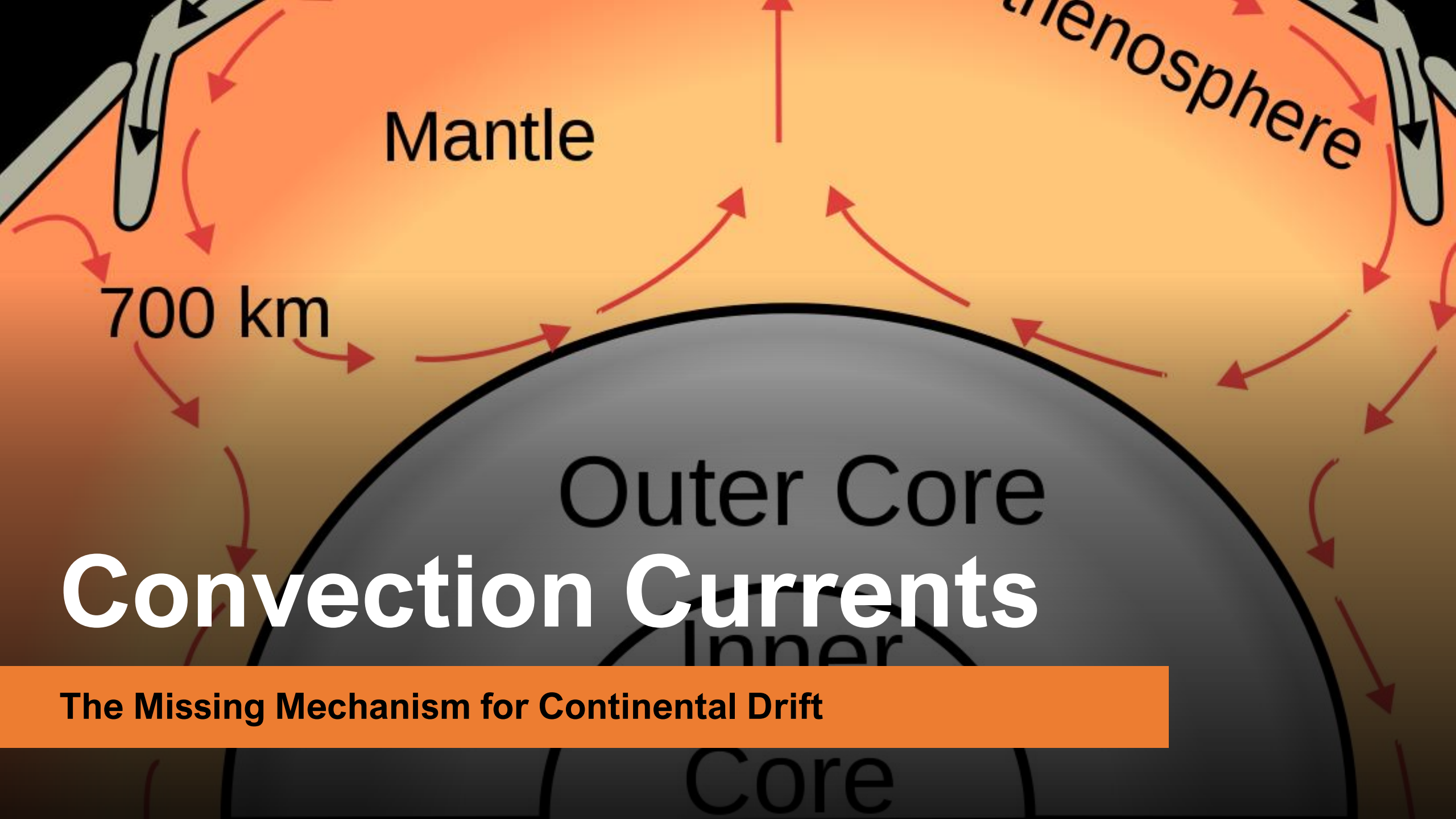
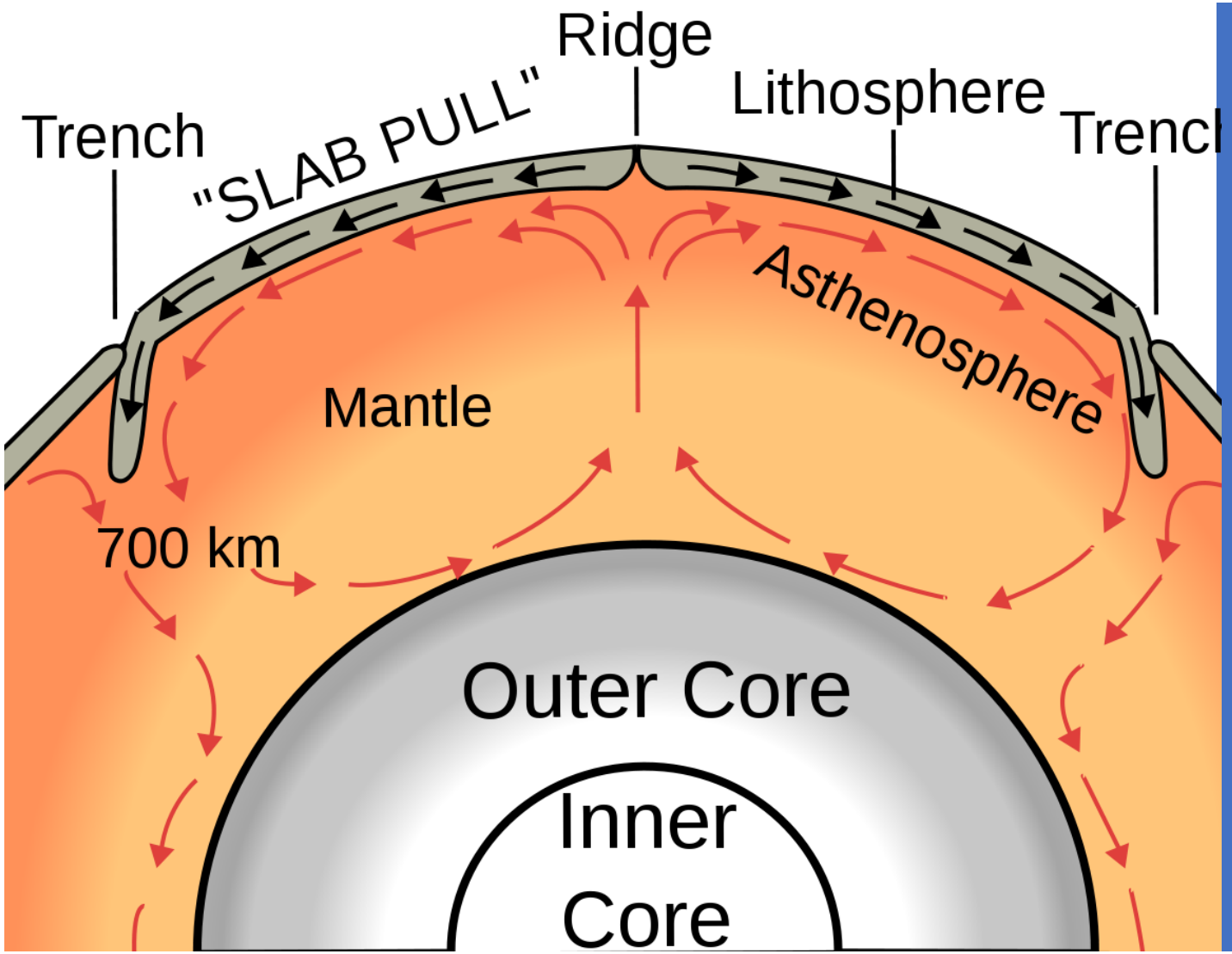


Convection Currents

The Missing Mechanism for Continental Drift



Objective

- To explain what causes convection currents in the Earth's mantle.

Question: What causes convection currents in Earth's mantle?

Convection and the Mantle

To explain how heat moves from Earth's core through the mantle, you need to know how heat is transferred.

There are three types of heat transfer:

Radiation - the transfer of energy through empty space; has no direct contact between heat source and an object.

Example: Sunlight warming Earth's surface

Conduction - heat transfer by direct contact of particles of matter. Example: Metal spoon heating up in a pot of hot soup.

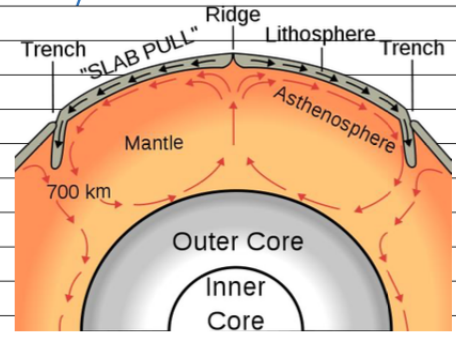
Convection - transfer of heat by the movement of a heated fluid (includes liquids and gases).

Heat transfer by convection is caused by differences in temperature and density within a fluid.

→ Density - measure of how much mass there is in a volume of a substance.

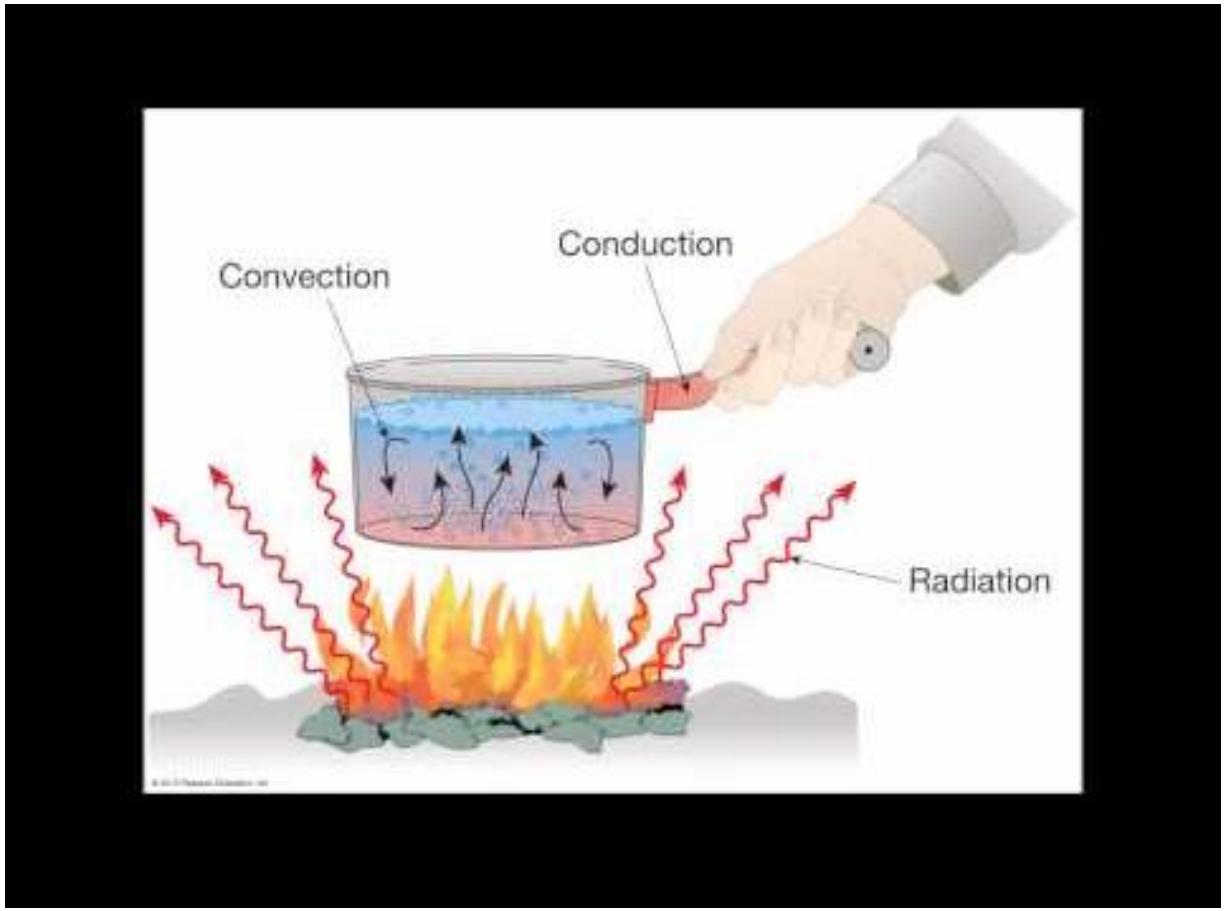
Example: heating water on a stove - as water on bottom gets hot, it expands, becomes less dense and rises; when the surface water starts warming up it becomes denser and moves to bottom causing a convection current, or the flow that transfers heat

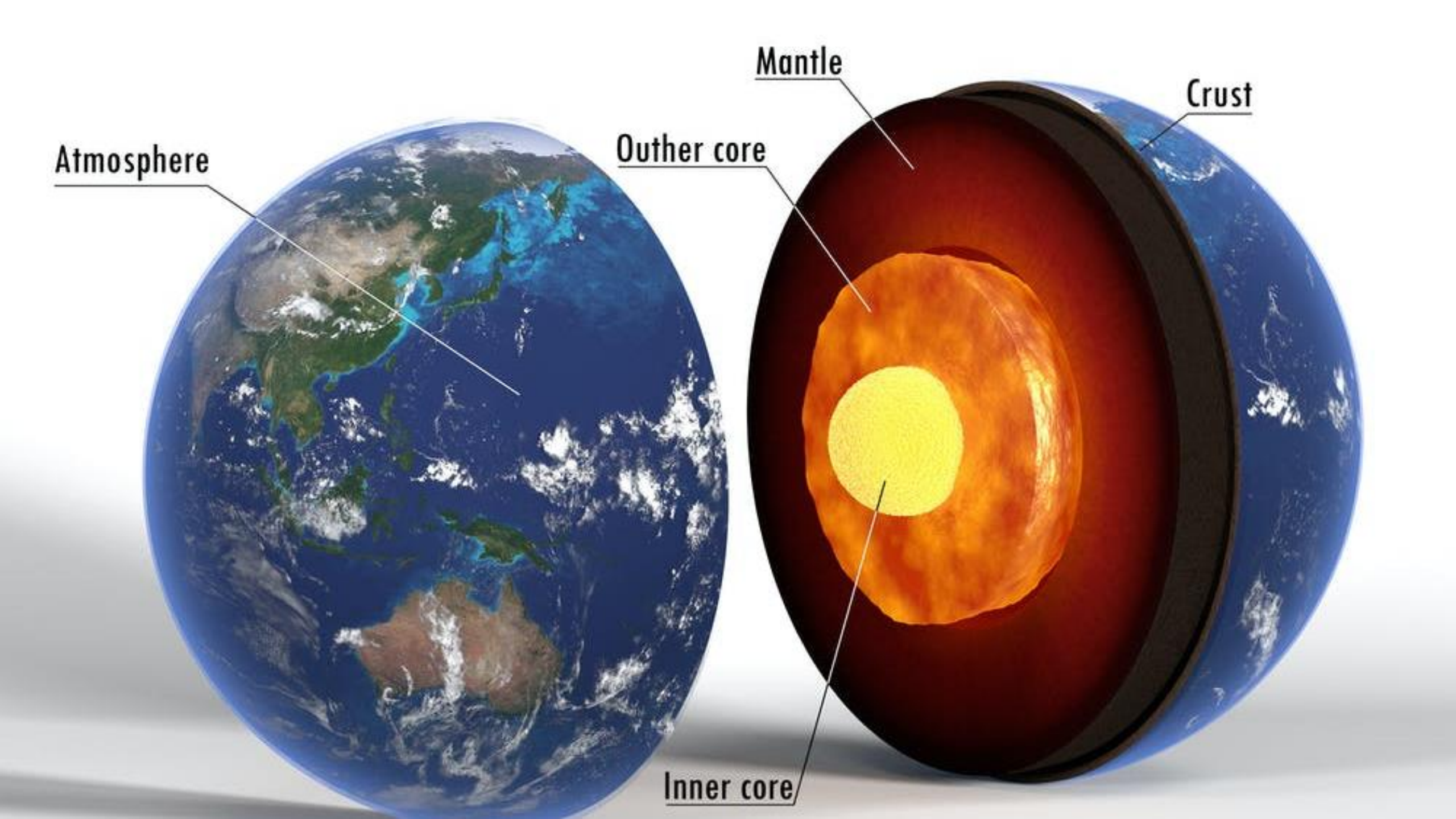
Convection currents flow in the mantle - heat source is the Earth's core and from the mantle itself. These currents have been acting like a conveyor belt moving the lithosphere above for the past four billion years!



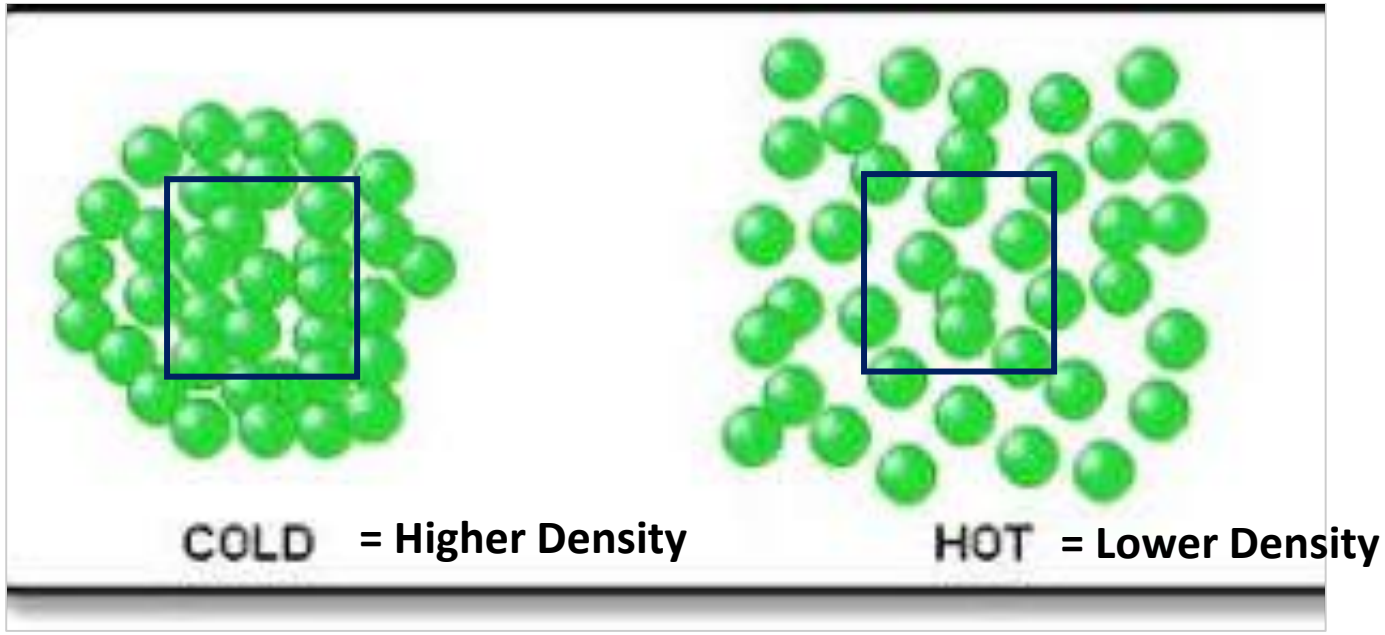
Three Types of Thermal Energy (Heat) Transfer

- Radiation
- Conduction
- Convection



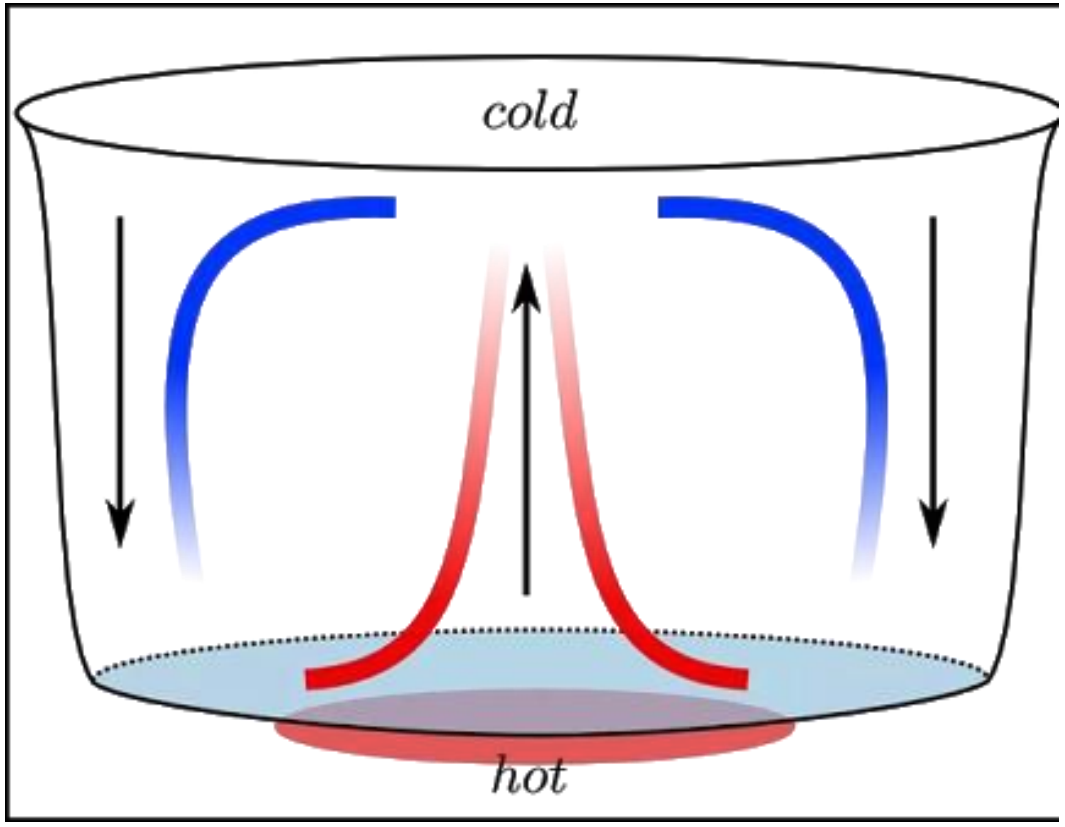

Atmosphere
Outher core
Mantle
Crust
Inner core

Density and Temperature

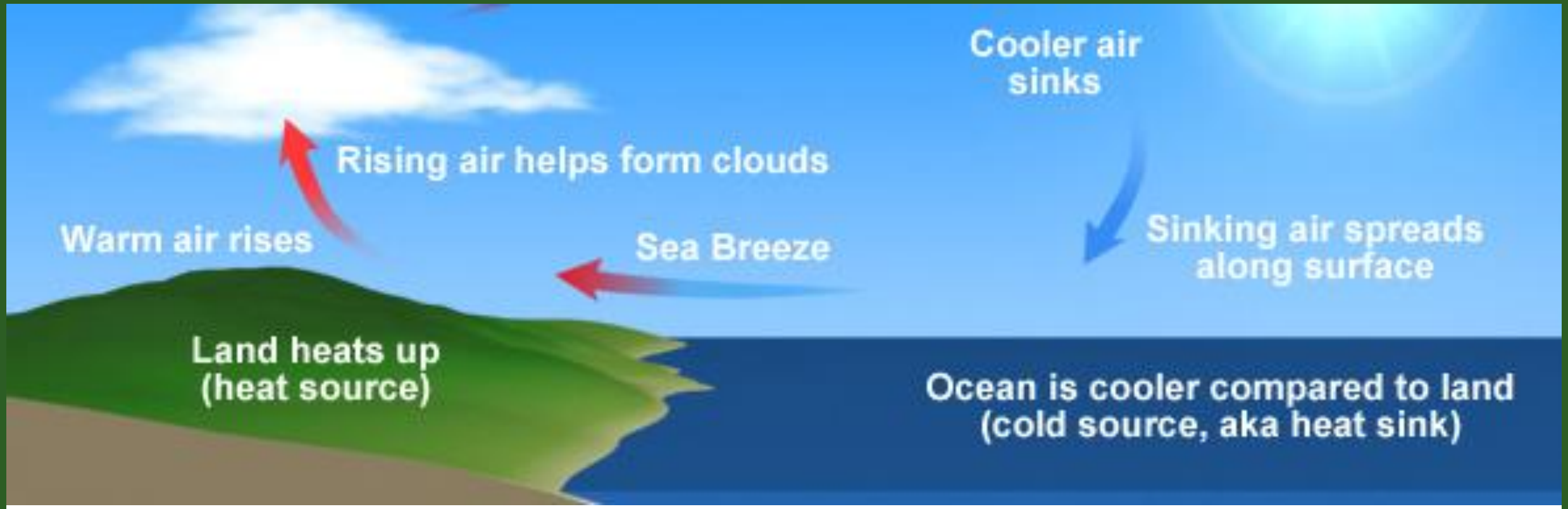


- Density = measure of how much mass there is in a volume of a substance.

Convection - Liquid

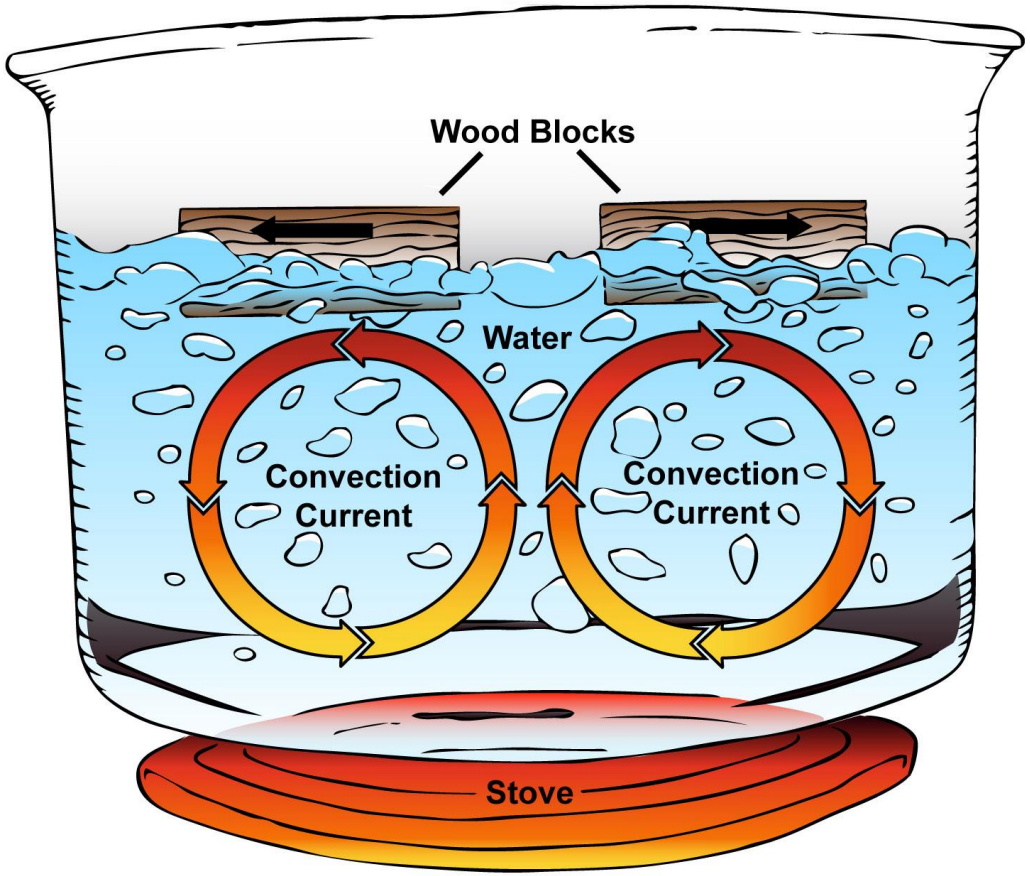


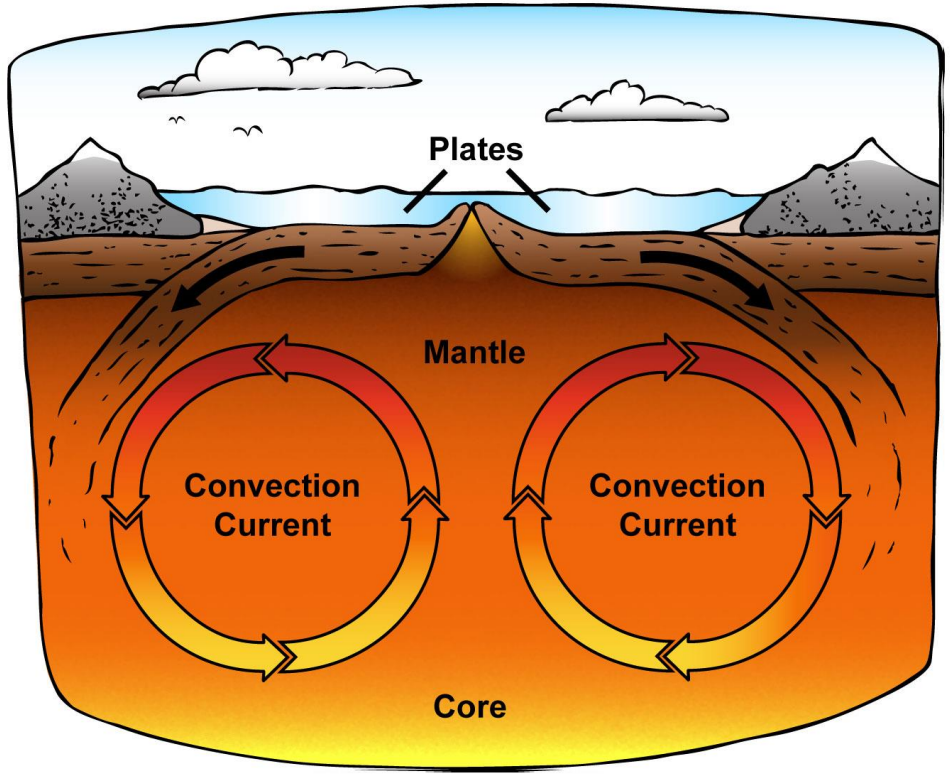
- Movement in a gas or liquid in which the warmer parts move up and the cooler parts move down due to density differences.
- **Convection Currents**



Convection - Gas

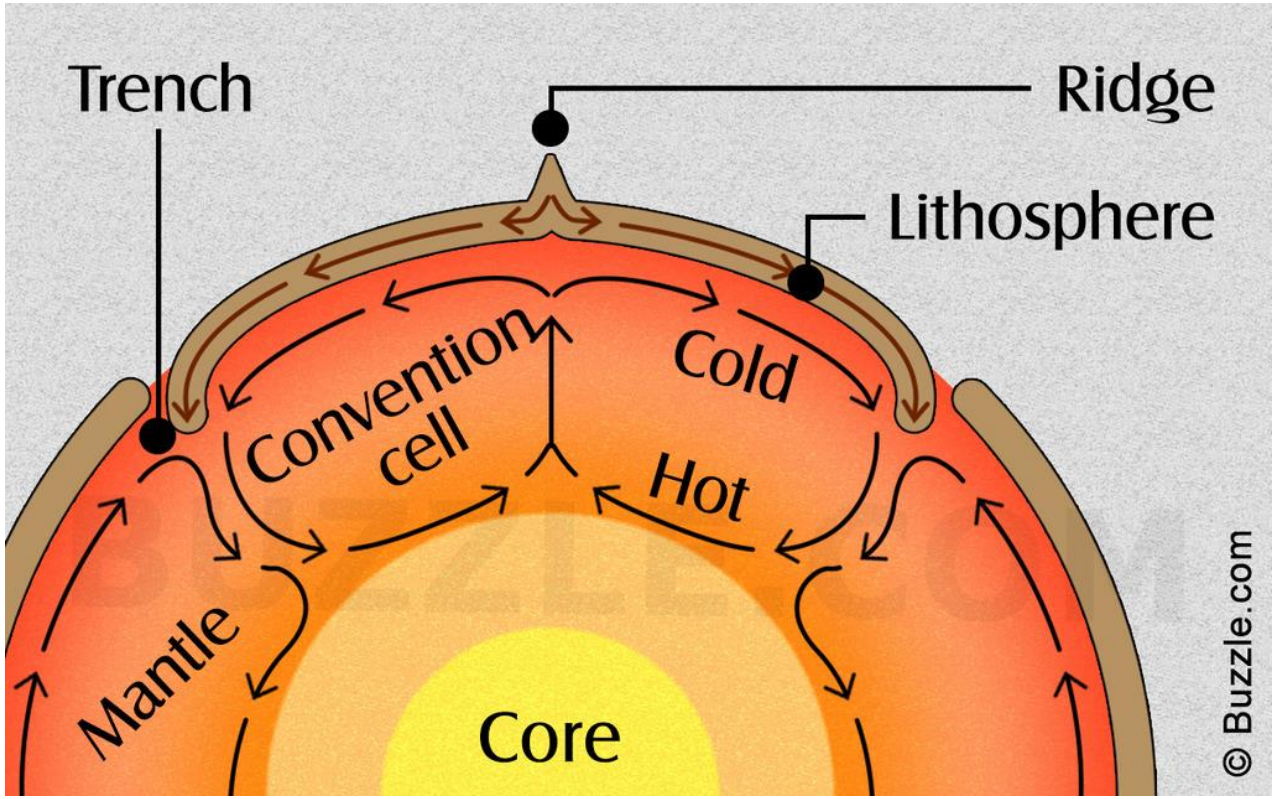
Convection Currents



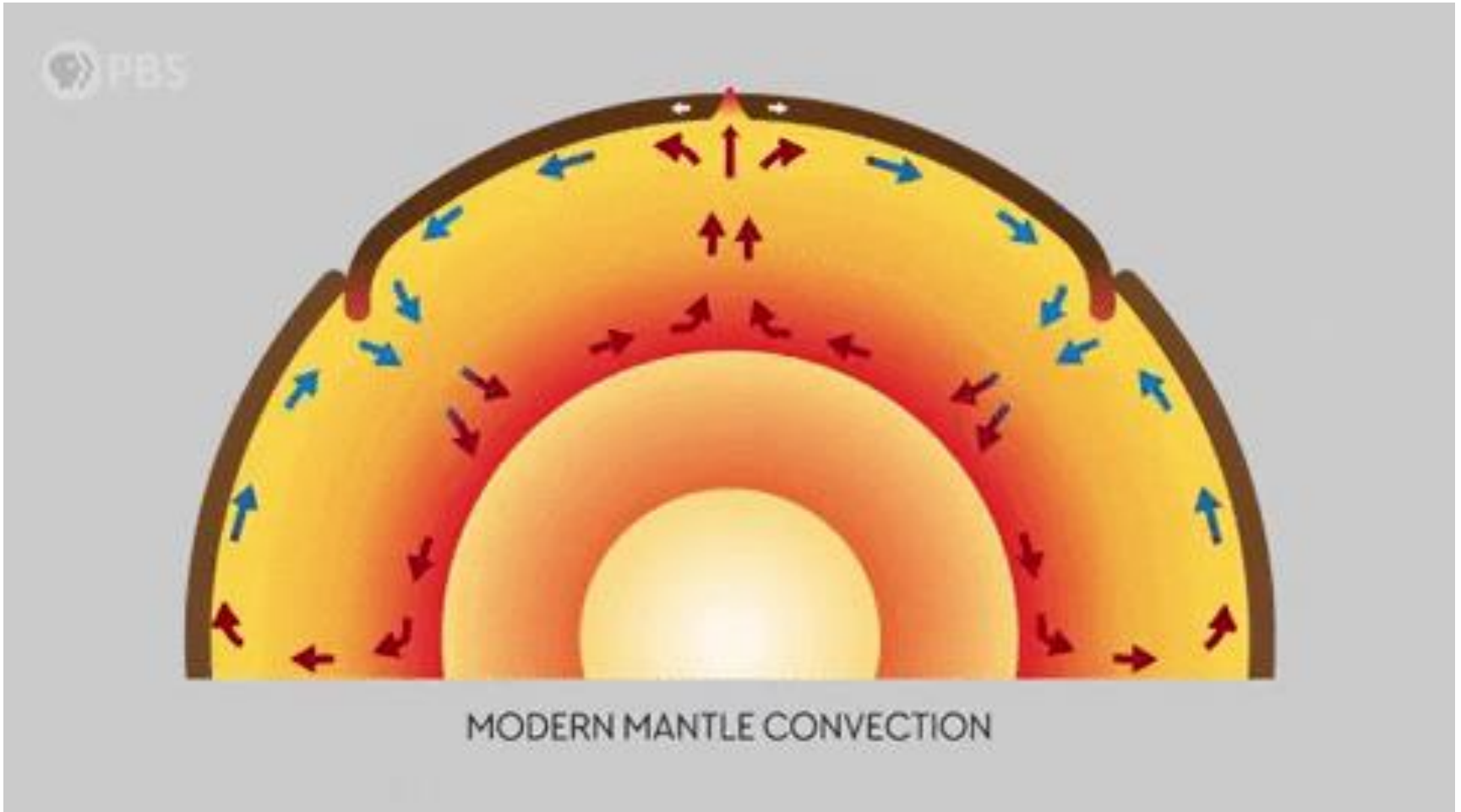


Convection Currents in the Mantle

- Temperature ➔ Density ➔ Convection Currents

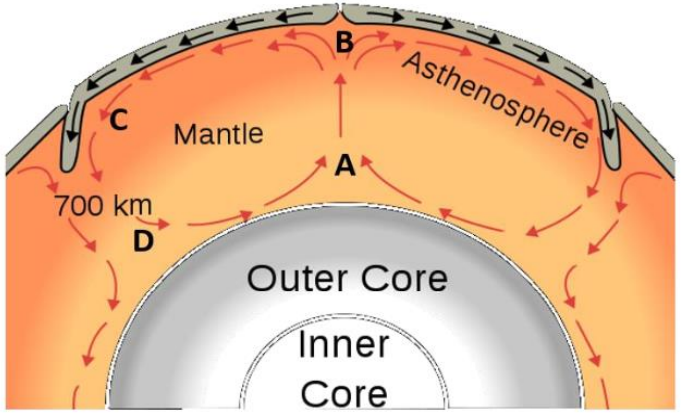


Mid-Ocean Ridges – Trenches/Subduction



Complete the Graphic Organizer

GRAPHIC ORGANIZER: CONVECTION CURRENTS



A

B

C

D

CAUSE

EFFECT

RESULT

Match each of these statements to positions A-D on the graphic organizer diagram

Write the full statement into the correct bubbles on your graphic organizer

The mantle material cools causing its density to increase and begins to fall.

The density of the mantle material is less than material above it and begins to rise.

Heat from the core increases the temperature of the mantle material causing its density to decrease.

Rising mantle material hits rigid lithosphere and cannot go up any further.