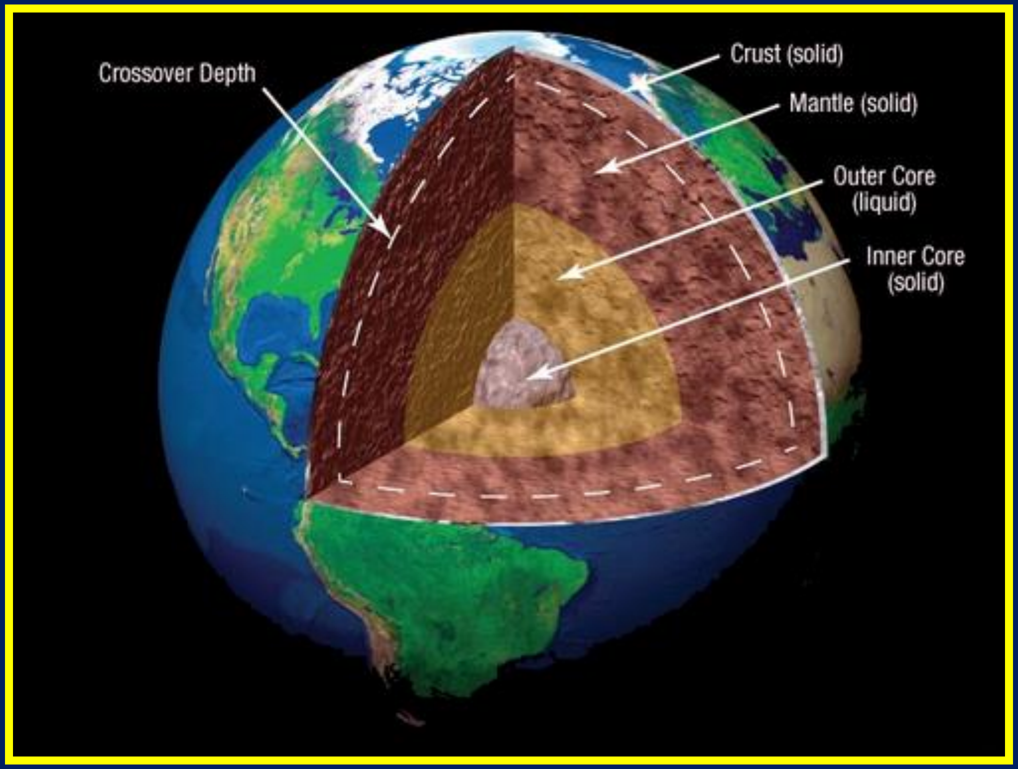
Structure of Earth



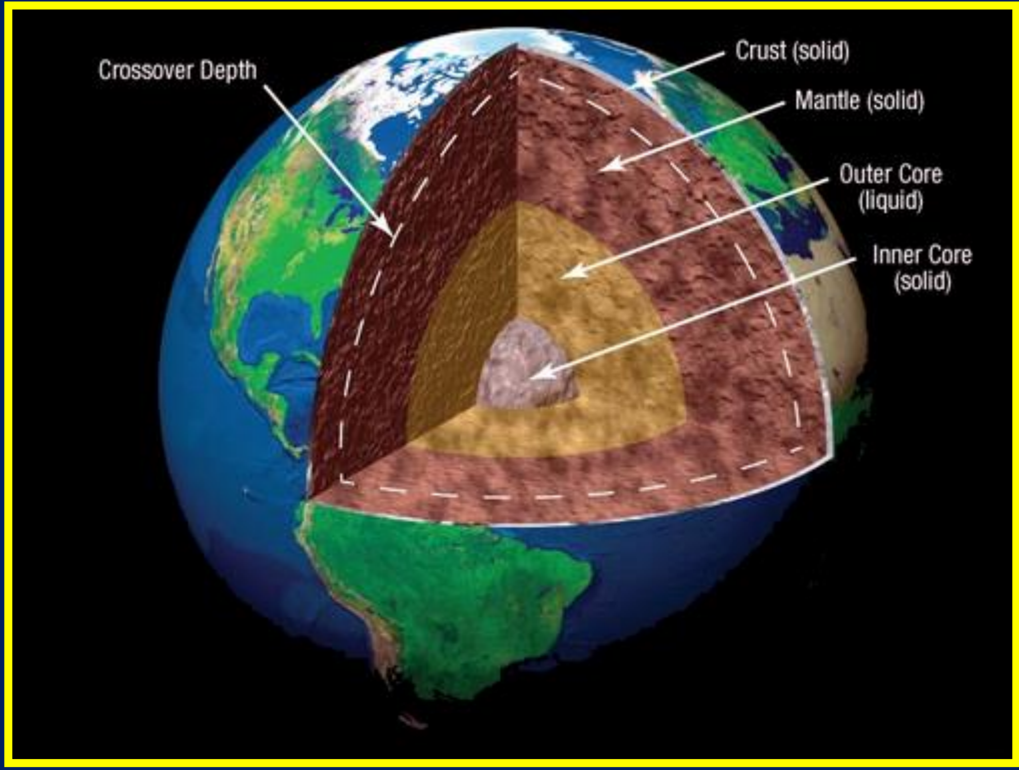
Essential Standard 2.1: Explain how processes and forces affect the lithosphere

Objective 2.1.1: Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere.

Scientists divide the Earth's System into four sub-systems:

Lithosphere System

The lithosphere includes both the rocky surfaces on the crust and the whole inside of Earth, as well.



Knowledge of Inner Earth

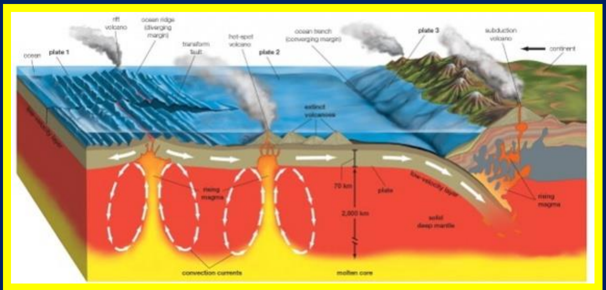
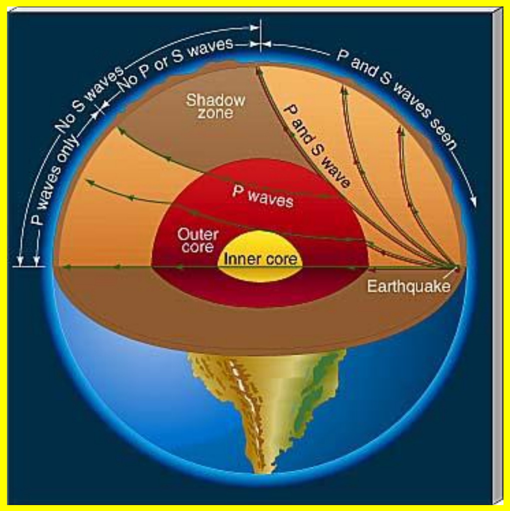


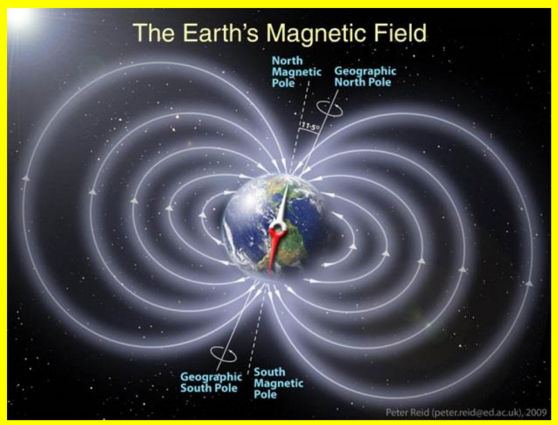
Plate Tectonics



Seismic Waves

Magma Composition

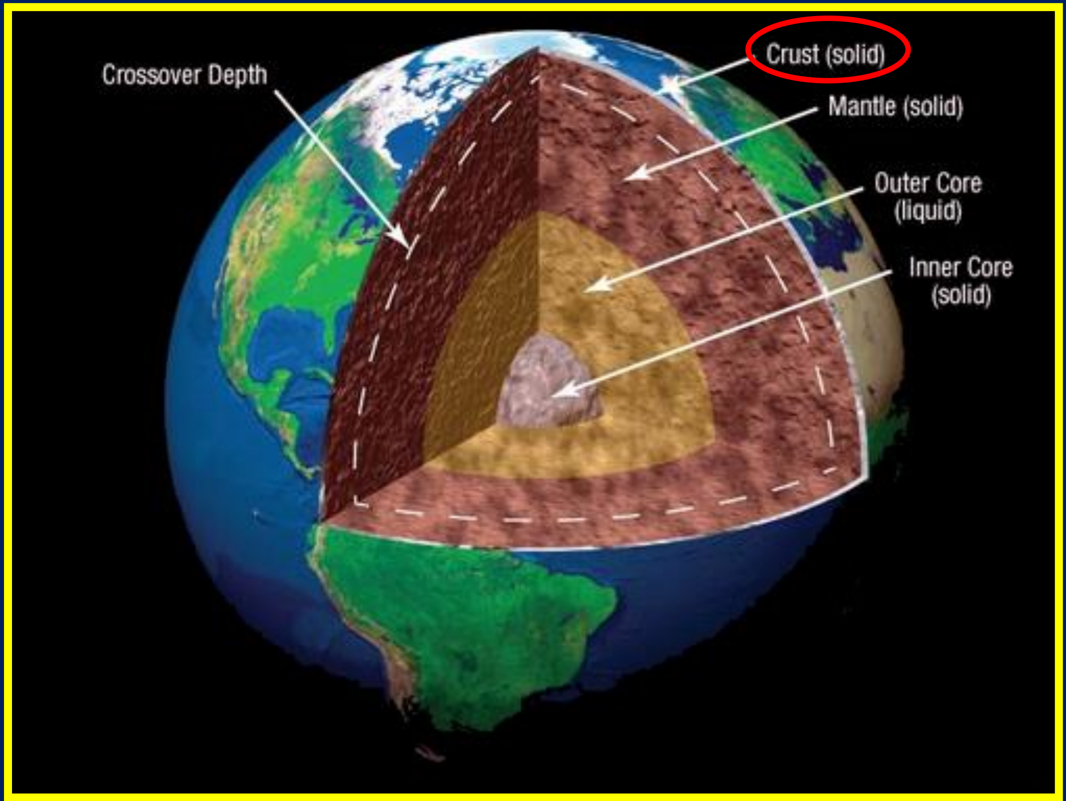
Meteorites



Magnetic Field

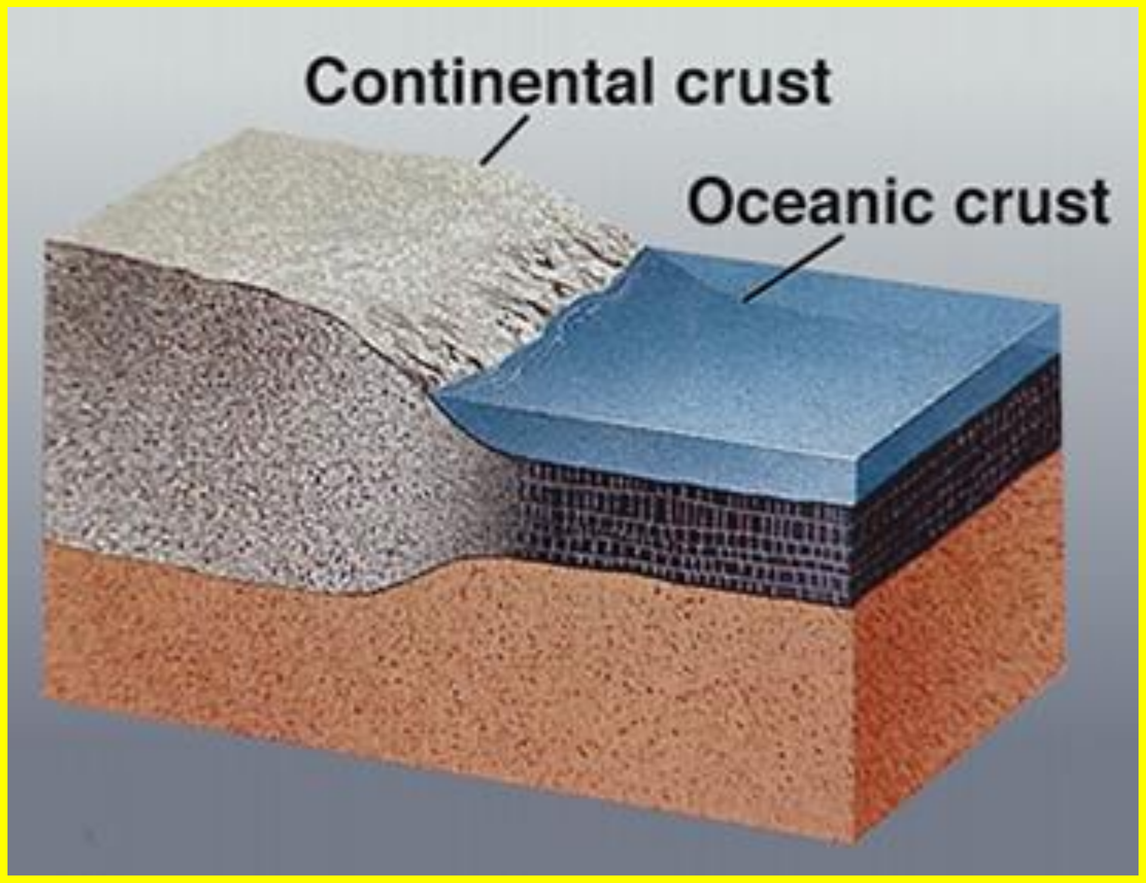
Earth's Crust

Earth's crust is the relatively thin, outermost, rocky layer of Earth, making up only 1% of Earth's total volume.



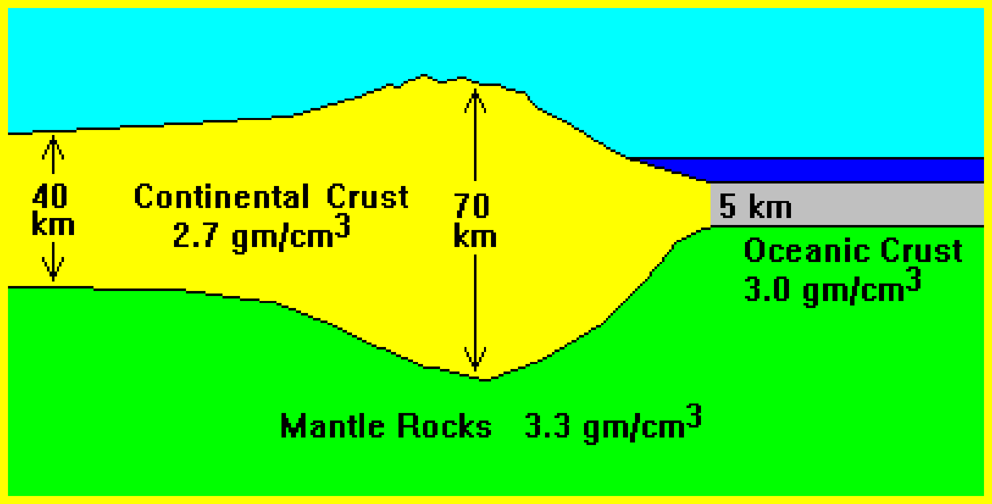
Earth's Crust

There are actually two different types of crust: Continental Crust and Oceanic Crust.



Continental Crust

Continental crust is found under land masses and its thickness ranges from 40 to 70 km.

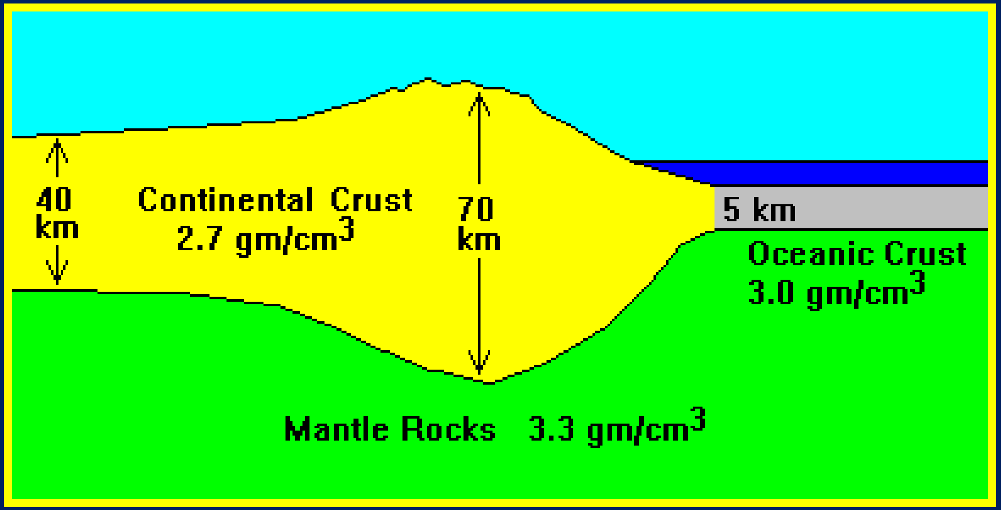


25 to 47 miles

Composed mostly of granite rock, continental rock has a density of about 2.7 g/cm^3

Oceanic Crust

Oceanic crust is found under the Ocean with a thickness of about 5 km.



3 miles

Composed mostly of basalt rock, oceanic crust has a density of 3.0 g/cm^3

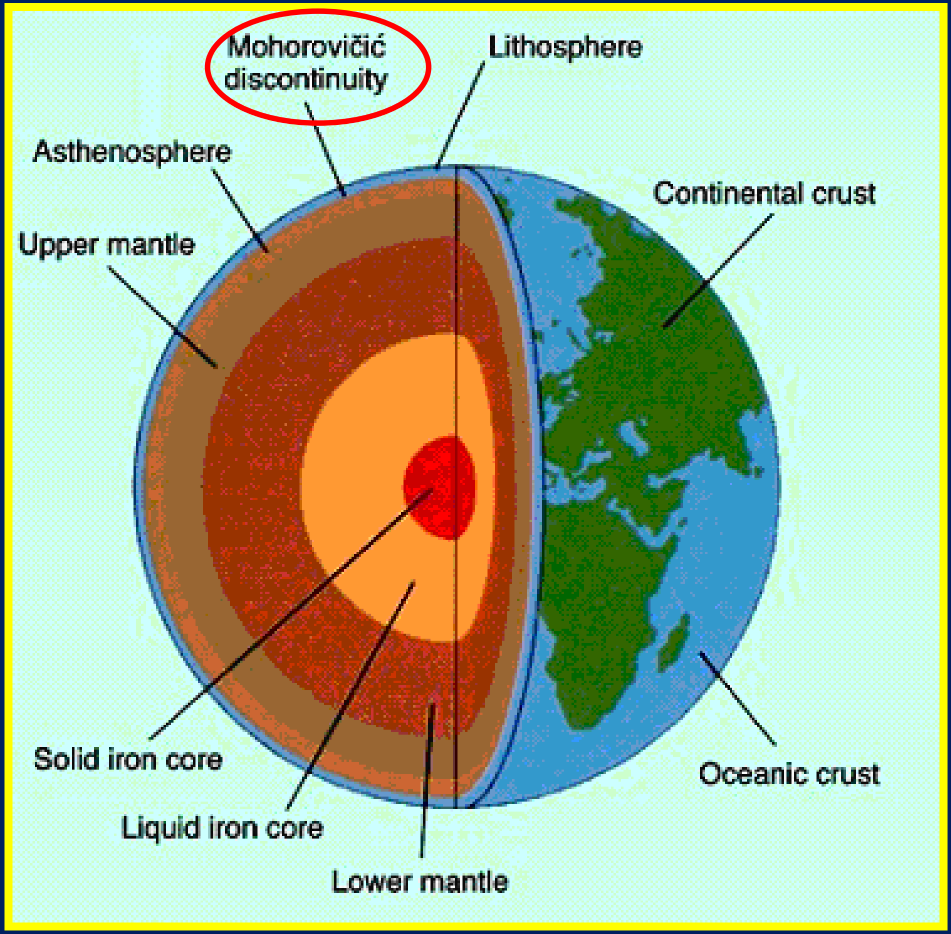
Oceans

Because the oceanic crust is thinner and more dense, it floats lower on the mantle than the continental crust and has been covered by water.

Mohorovicic Discontinuity

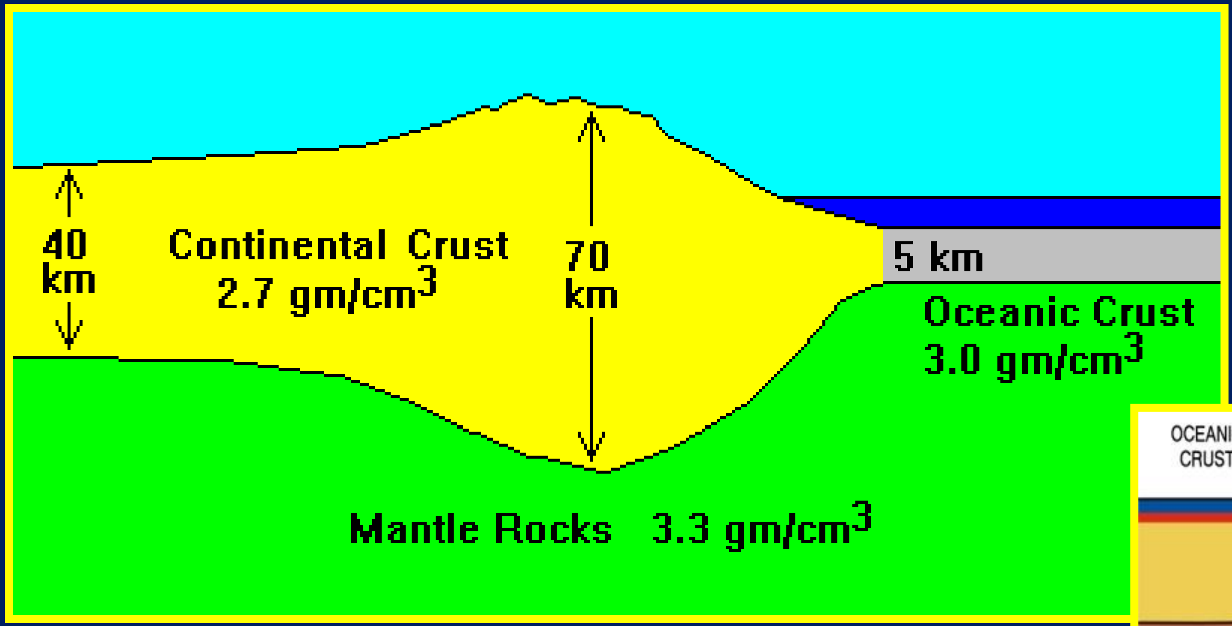
mo-ho-ROV-i-chich

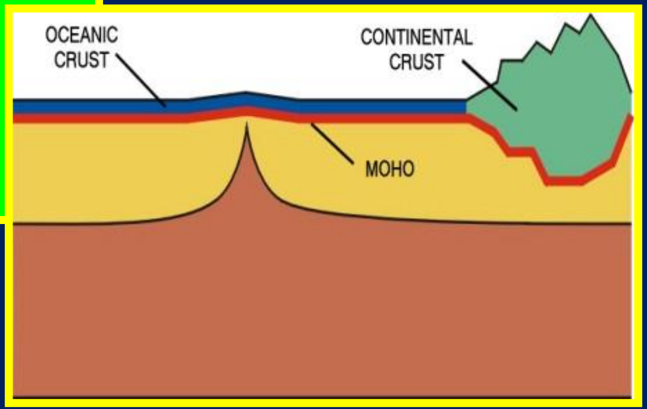
Between the Earth's crust and the upper mantle is a boundary called the Mohorovicic Discontinuity.



Mohorovicic Discontinuity

At the MOHO boundary, seismic waves change velocity due to the change in density between the crust and the mantle.

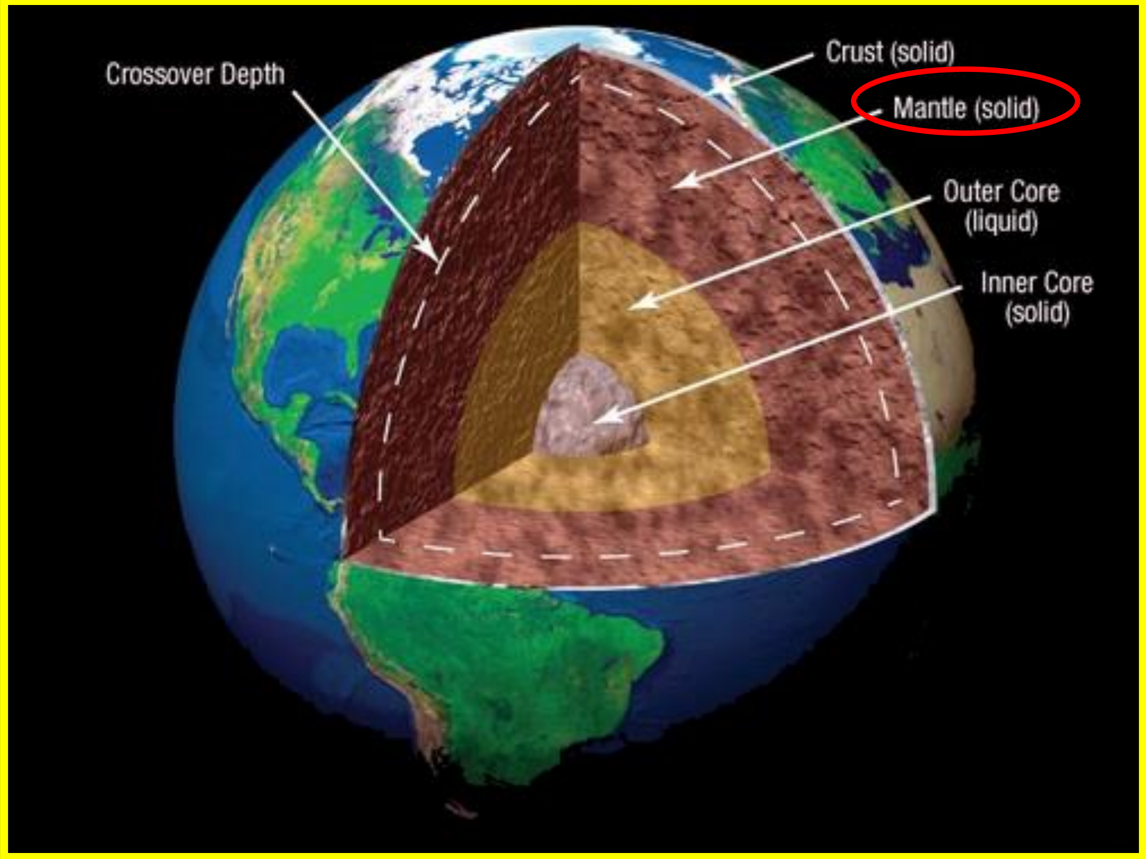




Earth's Mantle

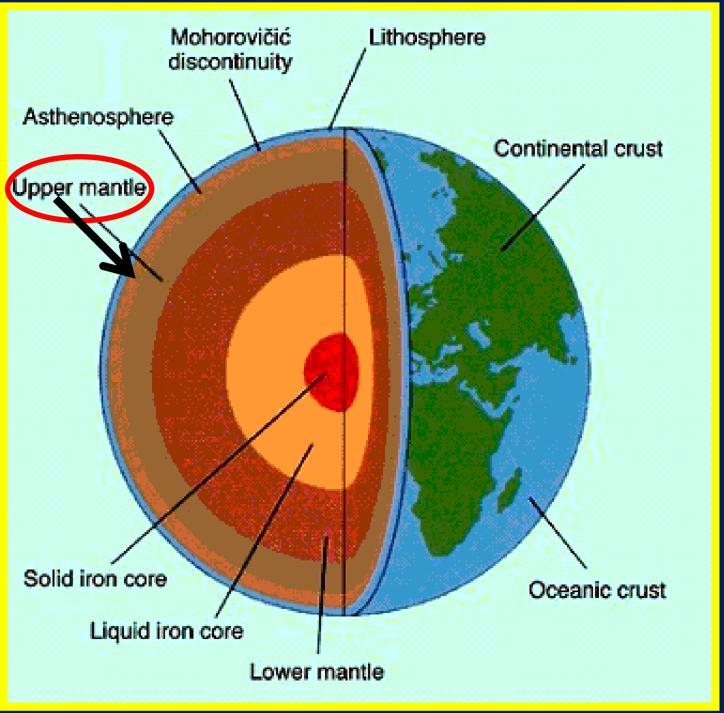
The Earth's mantle makes up 14% of Earth's volume, is about 2,890 km thick, and a density of 3.3 g/cm^3.

18,000 miles



Upper Mantle

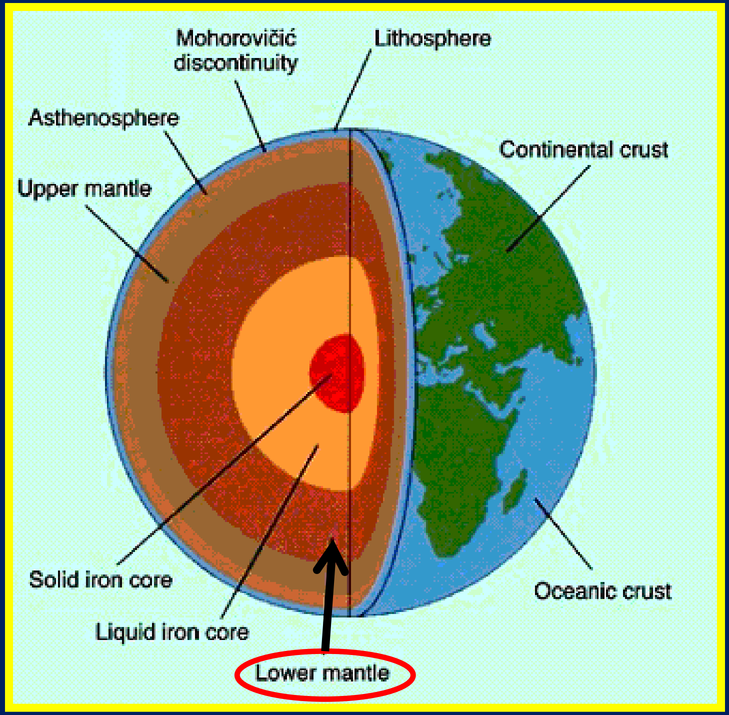
The upper mantle begins as completely solid rock but as depth increases, the temperature also increases, creating molten rock.



Molten rock located beneath Earth's surface is called magma.

Lower Mantle

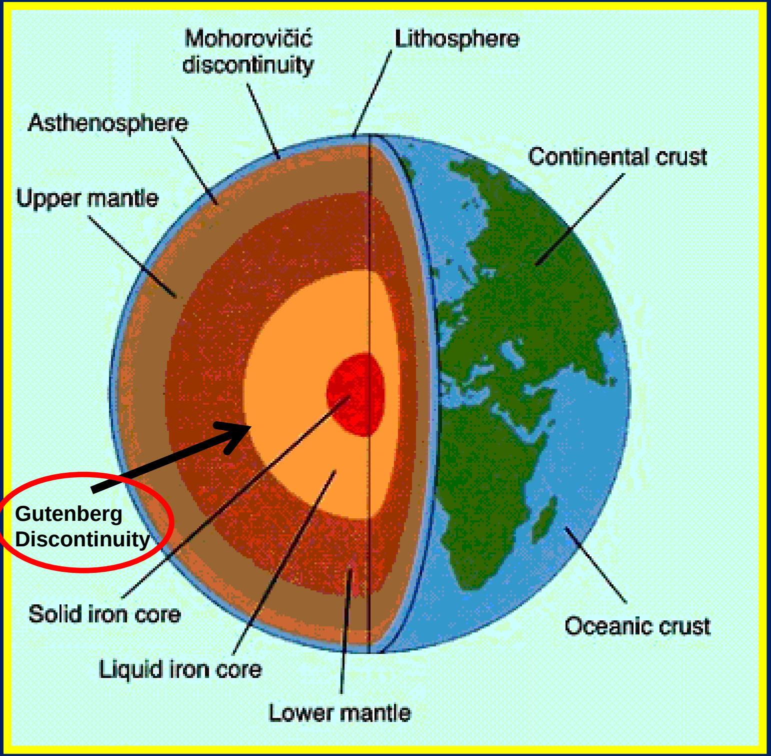
The lower mantle is composed of high density rocks made up of iron magnesium silicates



Higher pressure keeps rock in solid form, regardless of the higher temperature.

Gutenberg Discontinuity

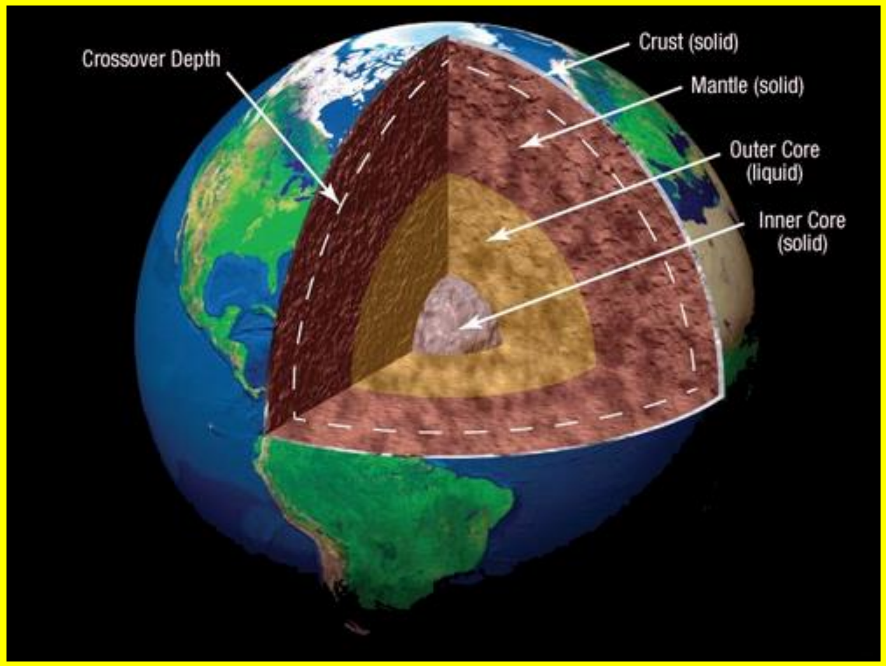
The boundary between Earth's lower mantle and outer core is called the Gutenberg Discontinuity boundary and is found 2,900 km deep.

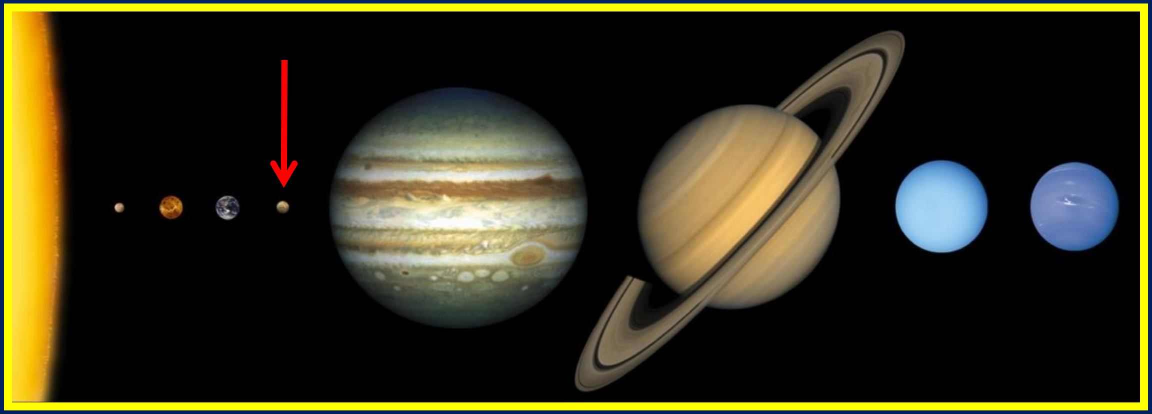


The boundary is detectable due to an abrupt change in seismic wave activity caused by a change in density and change in states of matter

Earth's Core

Earth's core makes up 84% of Earth's volume and is composed of iron, nickel, and sulfur with a density between 10.5 g/cm^3 and 13 g/cm^3

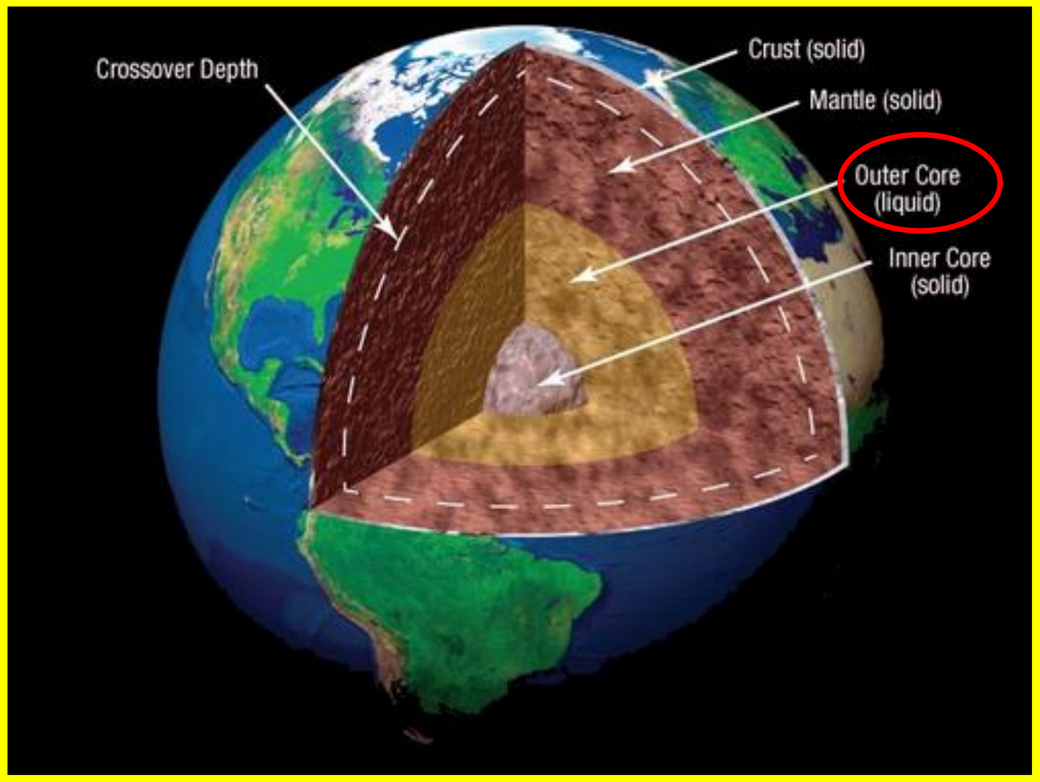




The core is about the same size as Mars

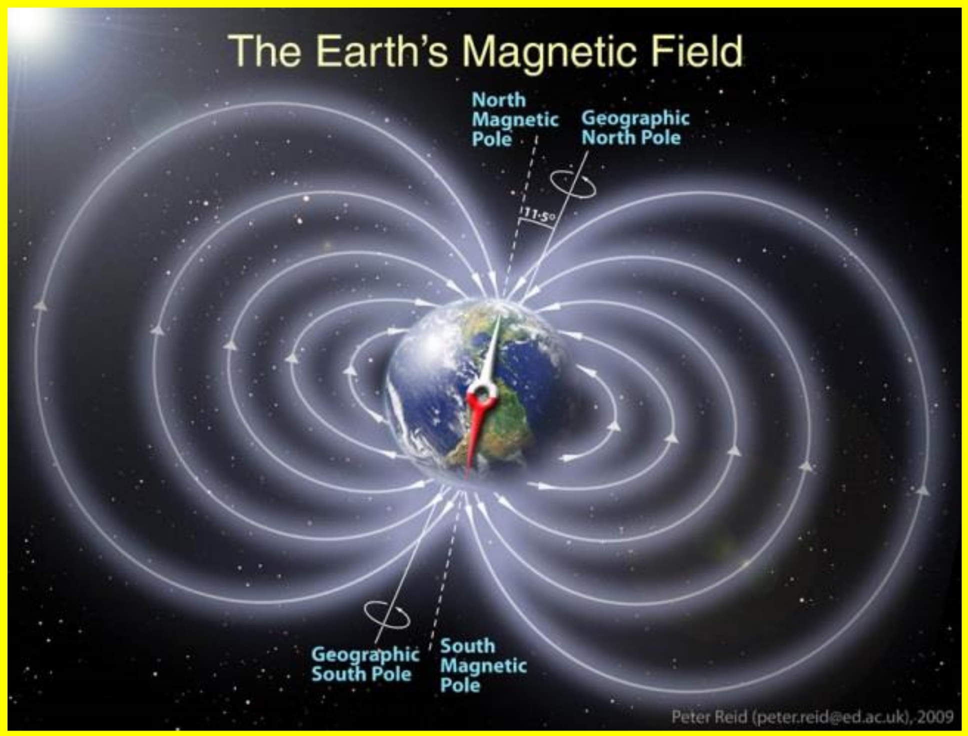
Outer Core

The Outer Core is the only completely liquid layer of Earth and is about 2,400 km thick with a temperature between 7,000 and 9,000 ^{0}F



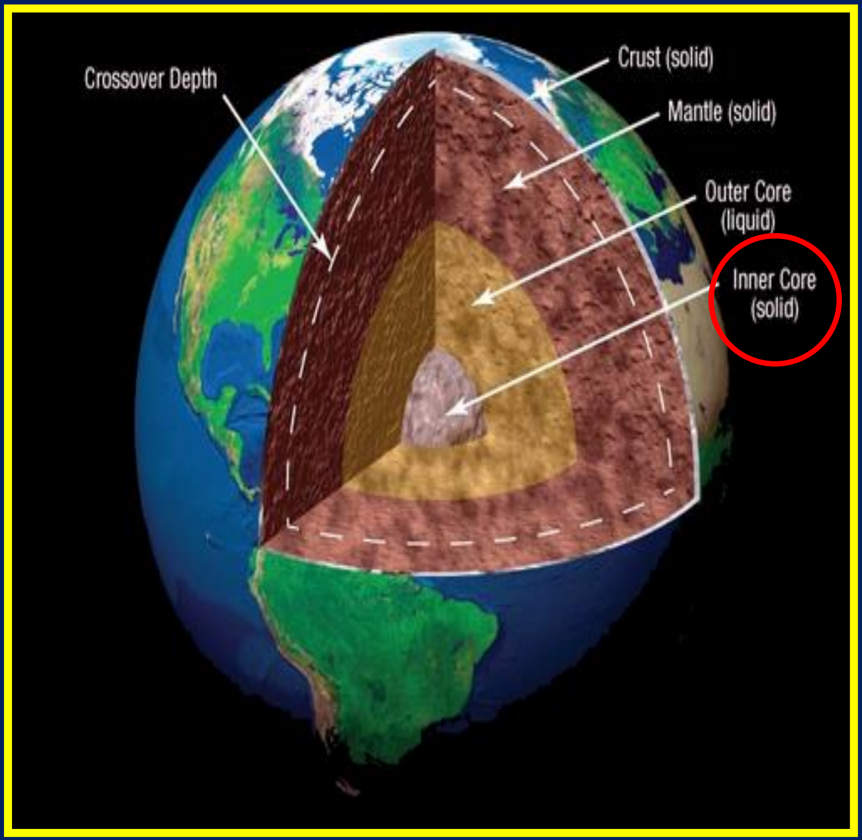
Outer Core

The spinning of Earth causes the liquid metals in the outer core to generate Earth's magnetic field that extends out into space.



Inner Core

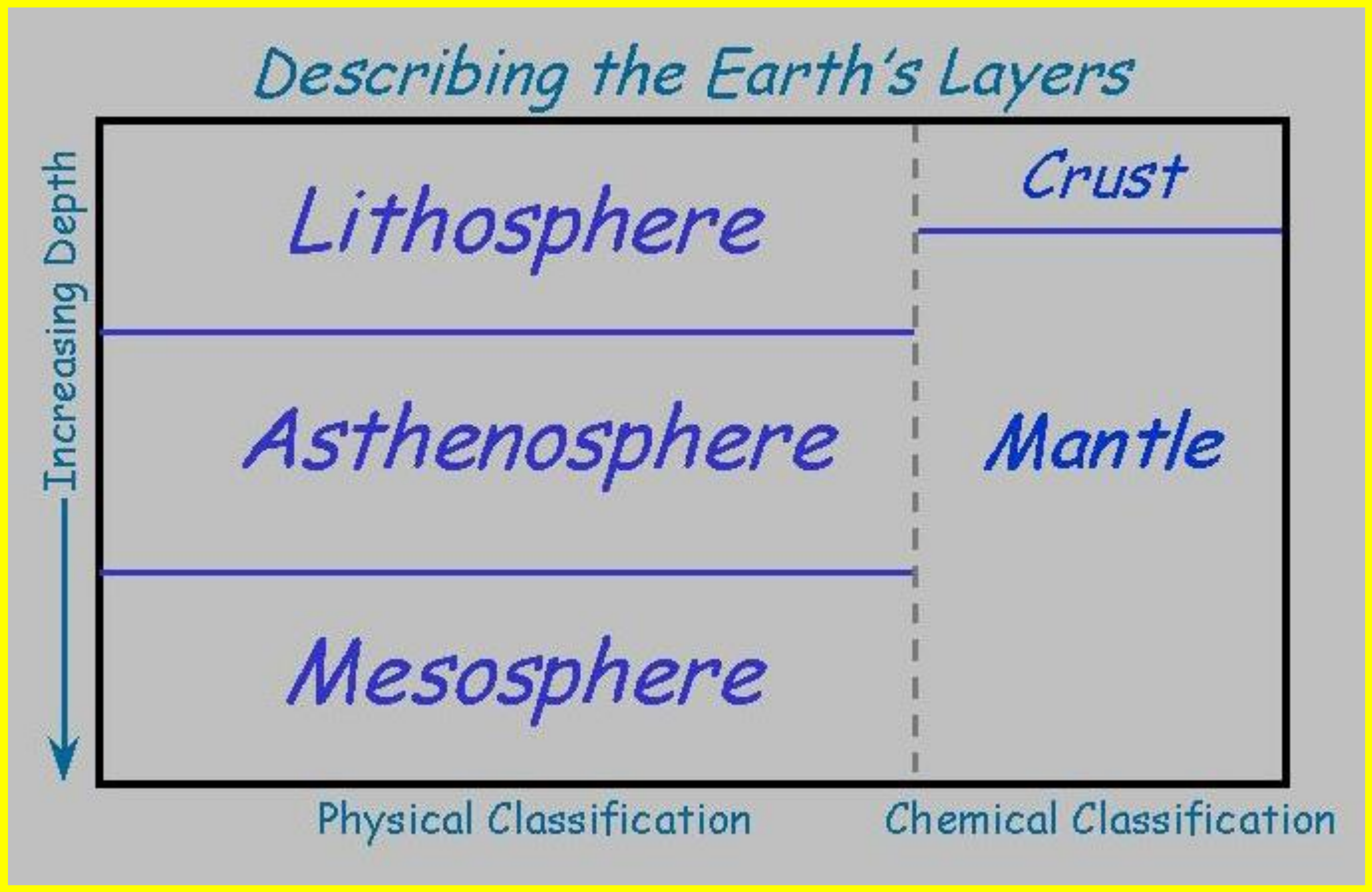
Earth's Inner Core is composed of solid iron and nickel with a density of 12.9 g/cm^3 , a thickness of 1,221 km, and temperatures between 9,000 and 13,000 ^{0}F.



High pressure keeps the iron and nickel in solid form, even though the temperature is as hot as the surface of the Sun

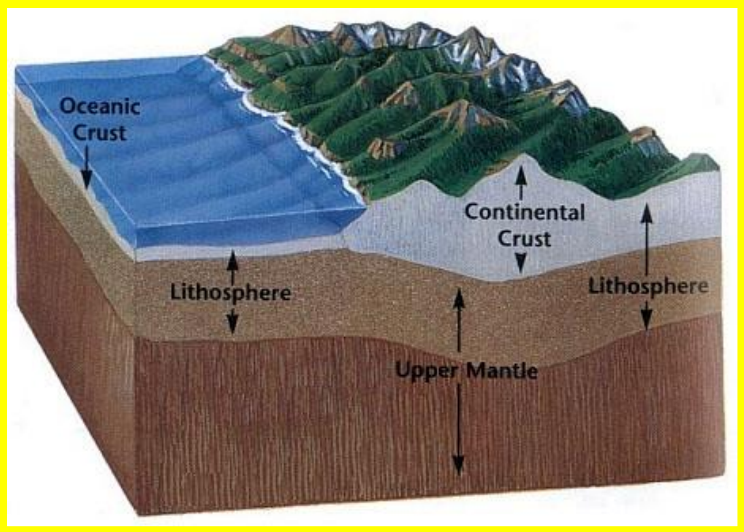
Crust and Mantle Spheres

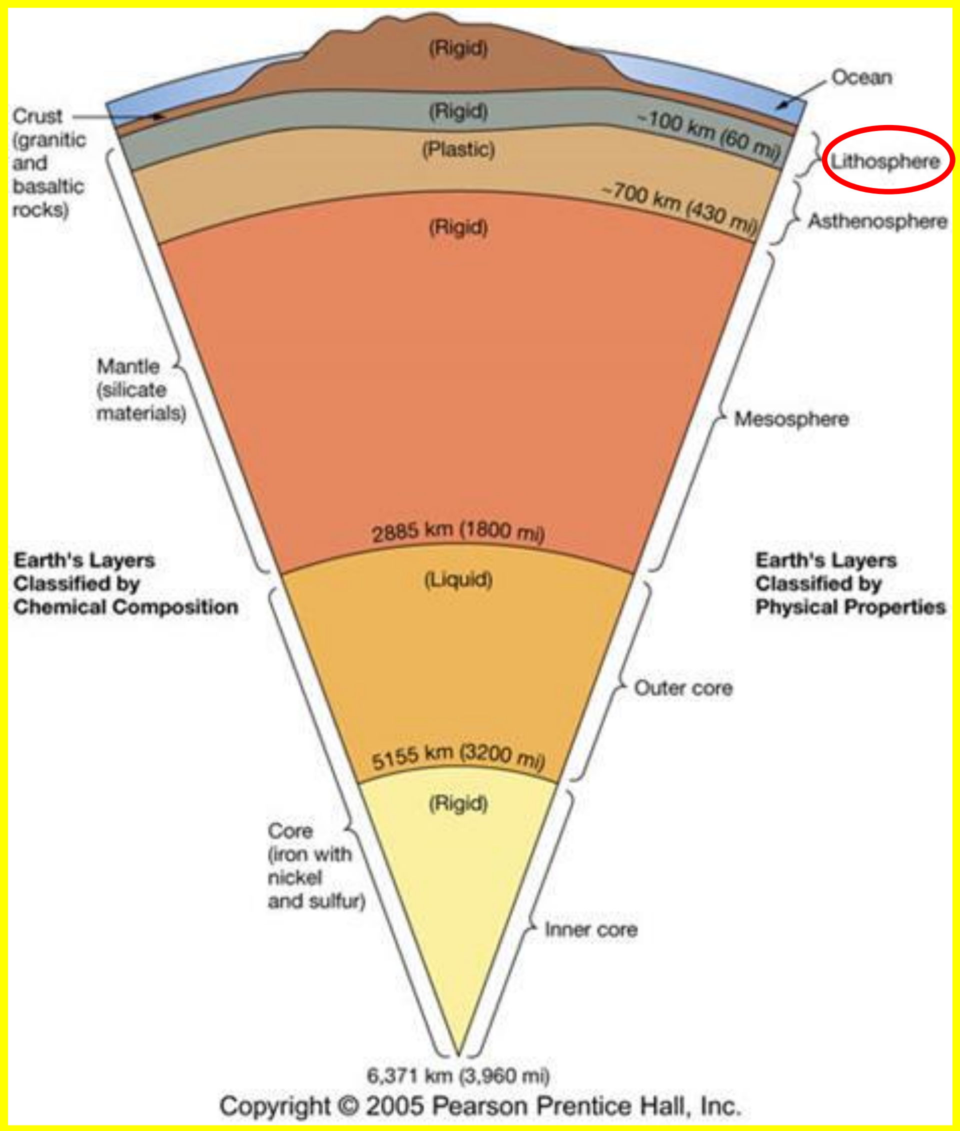
Based on if the rock material is solid and rigid or molten and fluid



Lithosphere

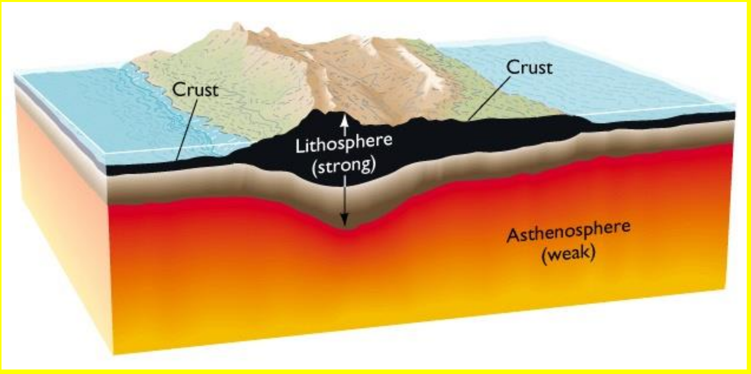
The lithosphere includes the crust and the solid part of the upper mantle.

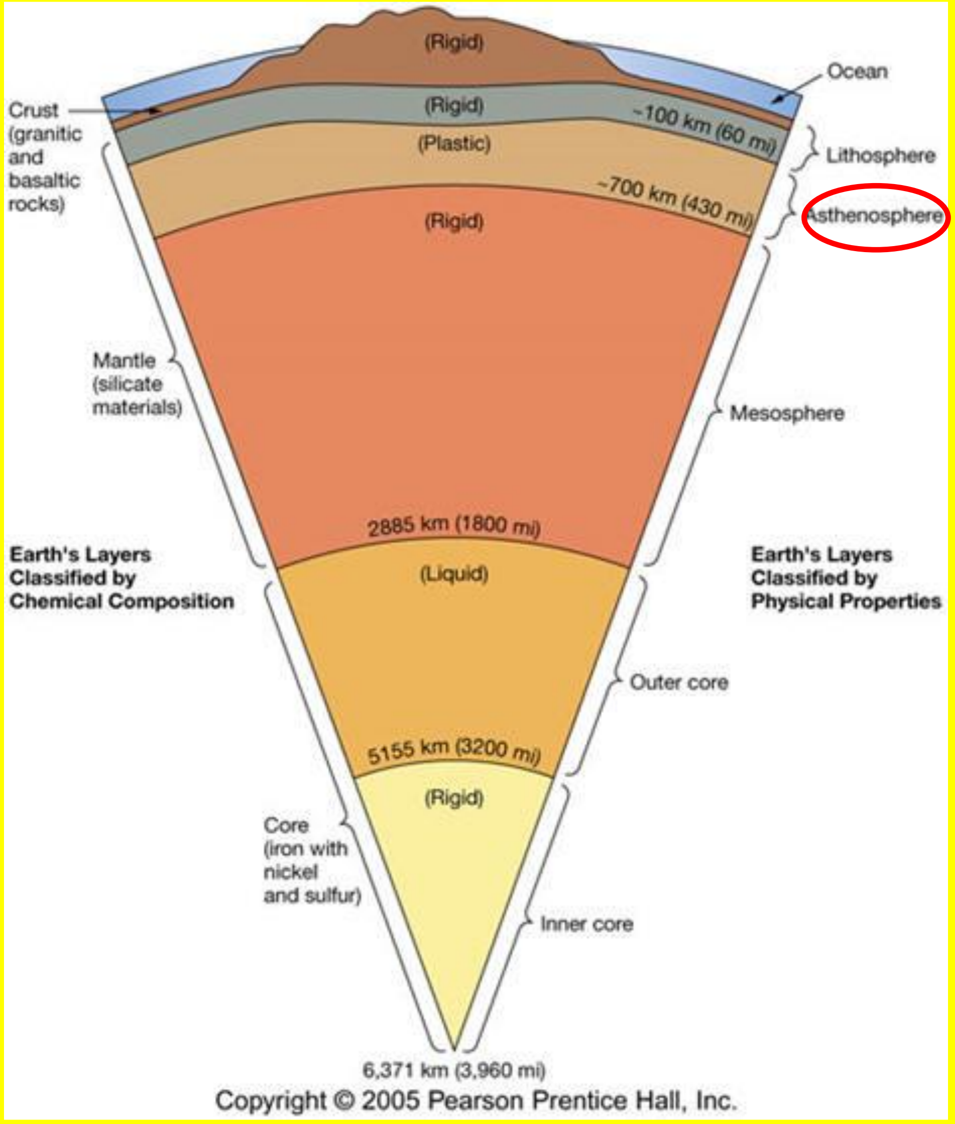




Asthenosphere

The Asthenosphere is made up of the hot, fluid, molten part of mantle.

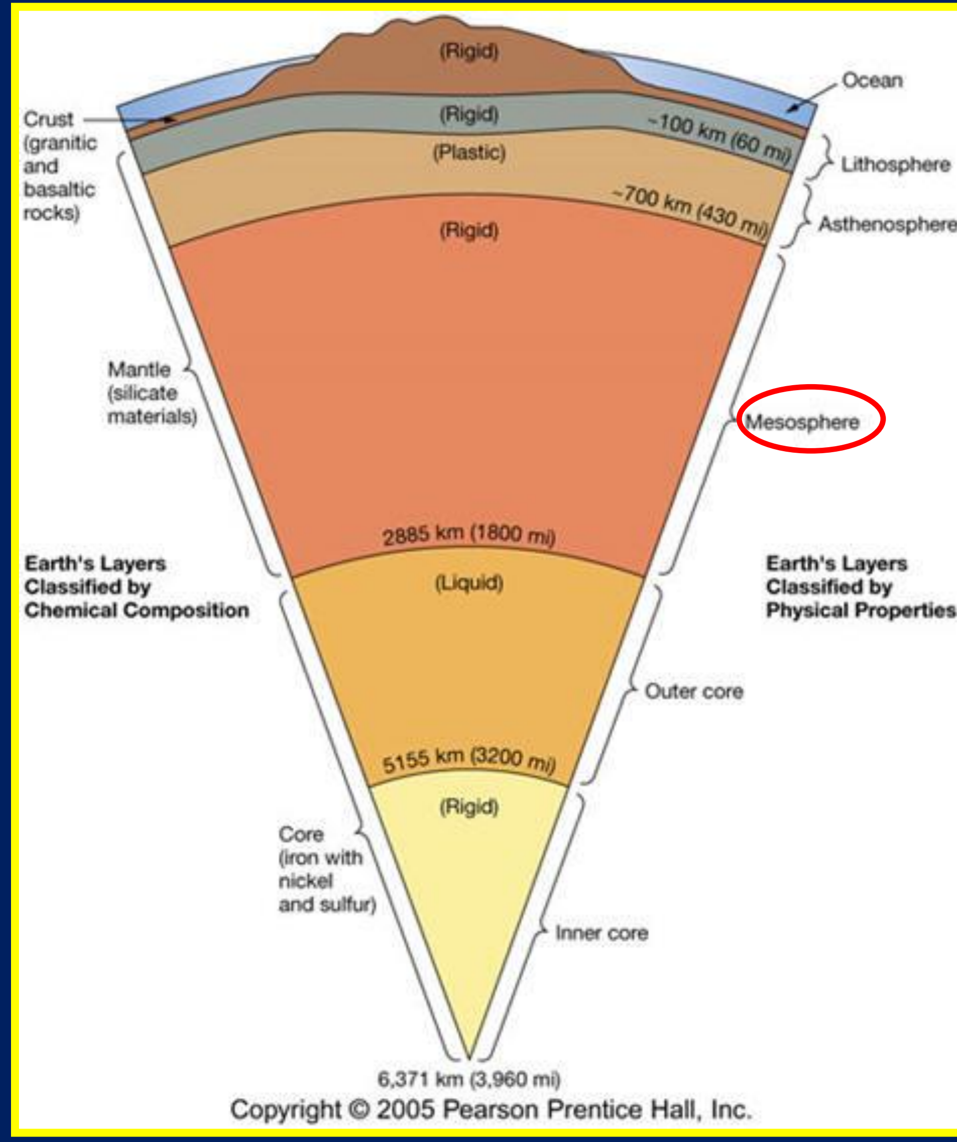




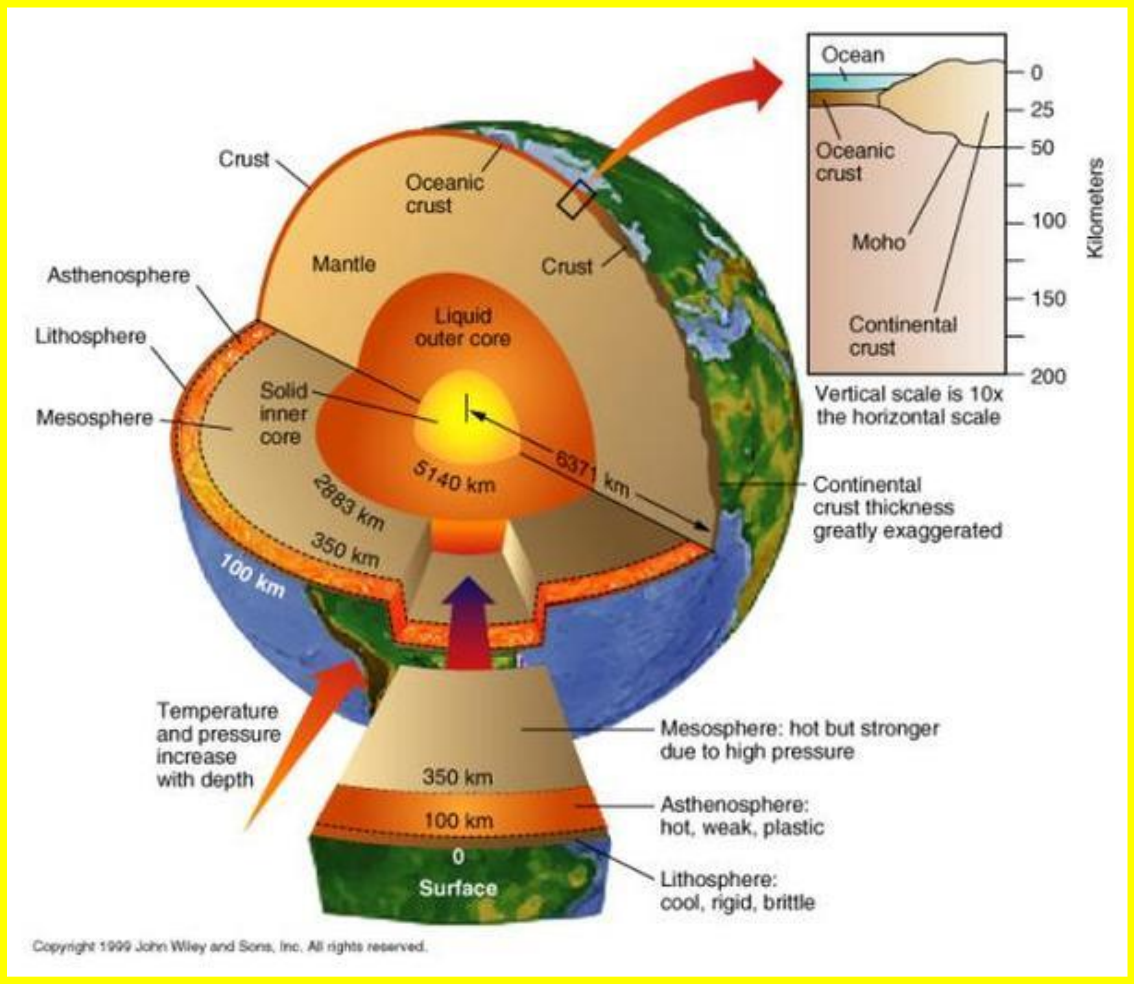
Mesosphere

The Mesosphere consists of the solid portion of mantle

High pressure prevents rock from being liquid



The End


Crust
Oceanic crust
Mantle
Crust
Asthenosphere
Lithosphere
Mesosphere
Liquid outer core
Solid inner core
5140 km
6371 km
2883 km
350 km
100 km
Ocean
Oceanic crust
Moho
Continental crust
0
25
50
100
150
200
Kilometers
Vertical scale is 10x the horizontal scale
Continental crust thickness greatly exaggerated
Temperature and pressure increase with depth
Mesosphere: hot but stronger due to high pressure
Asthenosphere: hot, weak, plastic
Lithosphere: cool, rigid, brittle
350 km
100 km
0
Surface
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