Unit 6: Dynamic Planet: Plate Tectonics

Lecture 3

Objectives:

E3.2C - Describe the differences between oceanic and continental crust (including density, age, composition).

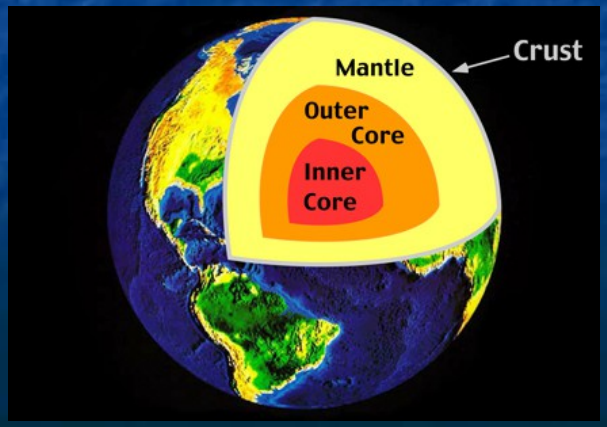
E3.r3e - Predict the temperature distribution of the lithosphere as a function of distance from the mid-ocean ridge and how it relates to ocean depth.

Earth's Interior

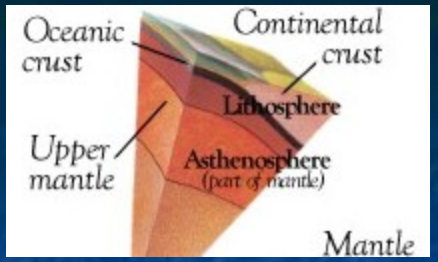
The original surface of the Earth probably looked much as the Moon's surface does today. The Earth was probably composed of the same material from its surface all the way to its center.

Objects colliding with Earth helped to cause Earth to grow hot enough that heavy elements such as iron and nickel melted.

The material composing Earth gradually separated into several layers, with the denser material being located near the center.



Crust Differences*



Oceanic Crust

- 6 - 7 km thick (4 - 7 miles)
- Rocks are not older than 200 million years
- Made up mostly of basalt
- Average density = 3 g/cm^3

Continental Crust

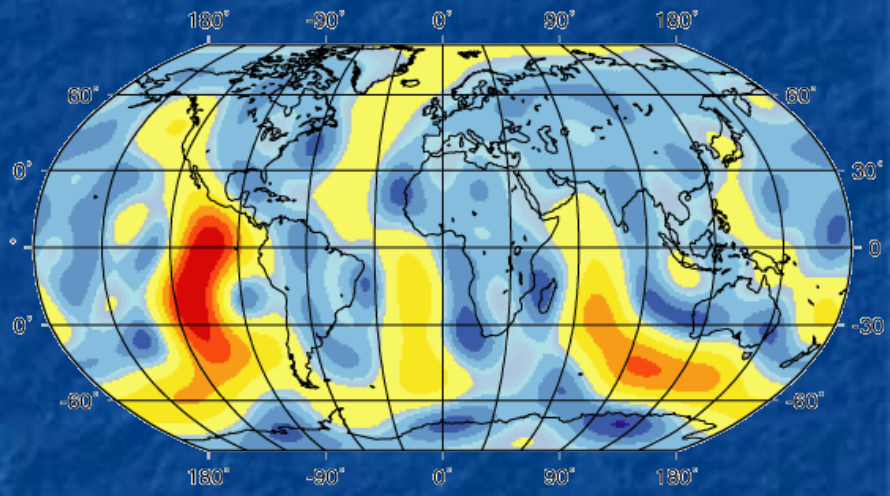
- 30 - 40 km thick (20 – 25 miles)
- Some rocks are 3.8 billion years old
- Made up mostly of granite
- Average density = 2.7 g/cm^3

Do you see why oceanic crust always subducts under continental crust?

Oceanic crust is more dense!

Global Heat Flow*

The "warm" colors yellow-orange-red indicate higher than average heat flow, the blues are lower. As you can see, the heat flow is greatest along the system of mid-ocean ridges. Further, the location of the high heat-flow regions correlates with shallow regions of shallow ocean depth (ridges on the sea floor) and the location of earthquakes - supporting evidence confirming the basic ideas behind plate tectonics.



Temperature Distribution*

The rocks located at the mid-ocean ridge are the hottest, as the magma has just exited the rift valley and was exposed to the cold ocean water. As the sea-floor spreads away from the mid-ocean ridge, the rocks continue to cool and become more dense. Ocean depth increases until the rocks reach the huge abyssal plains found at the deep ocean seabed.