1 Earth

We know a lot about this planet

1.1 Comparative Planetology

The study of planets through comparison and contrast to Earth

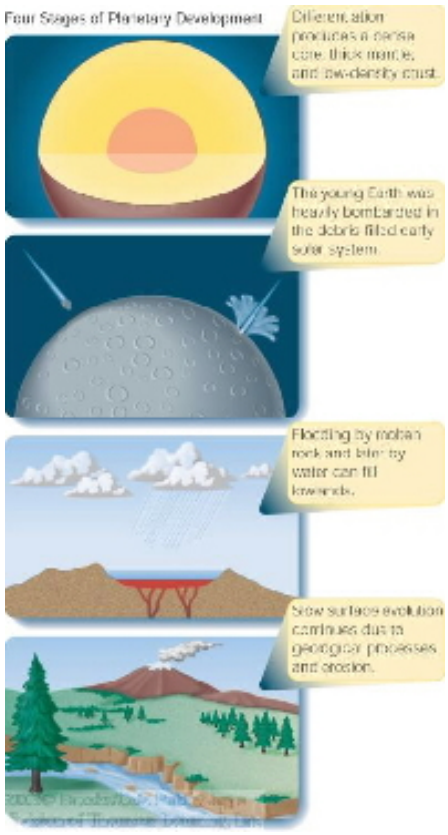
1.2 Four stages of planetary development

Differentiation - Earth melted; heat by the decay of radioactive elements and heavy bombardment

Cratering - Evident on all of the terrestrial planets

Flooding - from lava and water

Slow Surface Evolution - has continued for the last 3.5 billion years



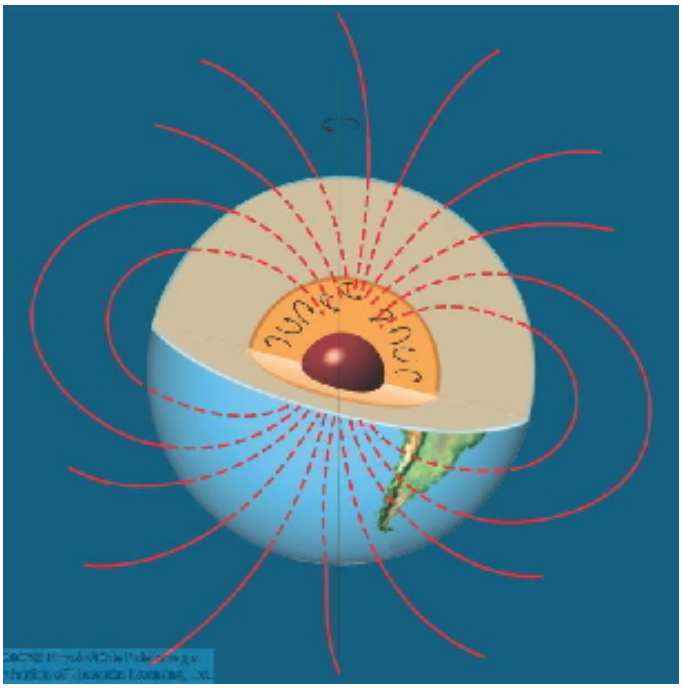
1.2.1 Interior

Inner core - dense, solid iron and nickel under great pressure

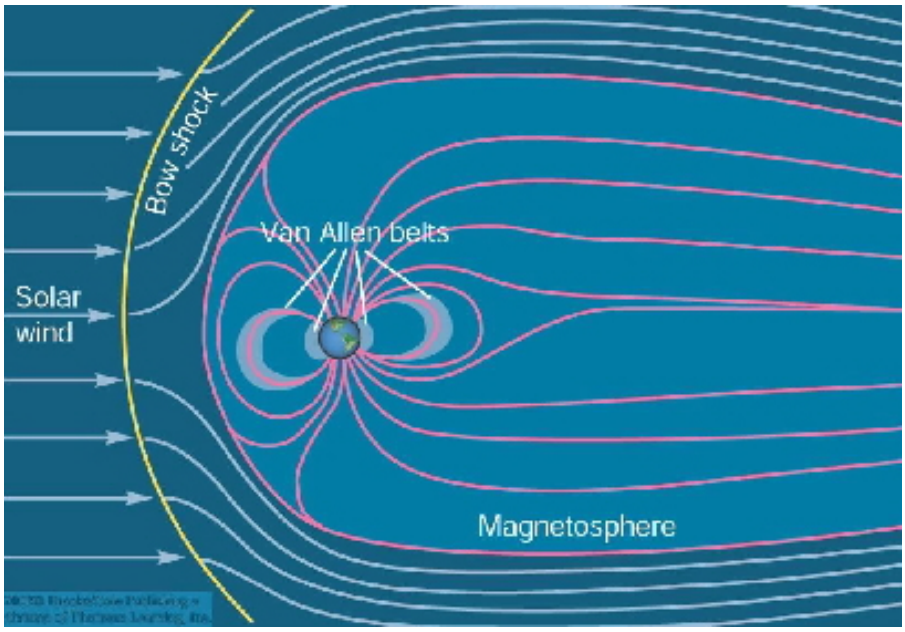
Liquid outer core - source of Earth's magnetic field
Mantle - molten rock heated from below
Crust - thin, floats on the mantle, contains the continents and oceans

1.2.2 Magnetic Field

Earth's magnetic field is generated in the liquid outer core and the Earth's rapid rotation



Magnetosphere



Solar Wind
Bow Shock
Van Allen Radiation Belts
Aurora Borealis

Field has reversed itself over 200 times throughout geologic history

1.2.3 Earth's Crust

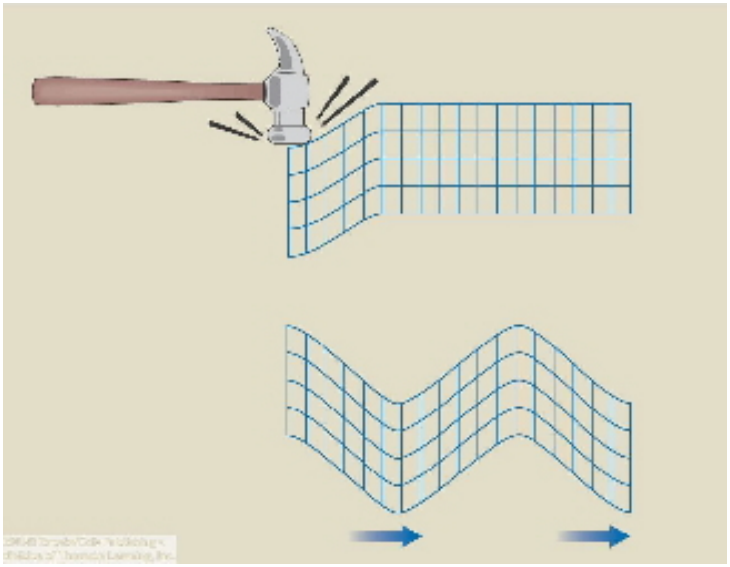
Active crust - crust is created and destroyed

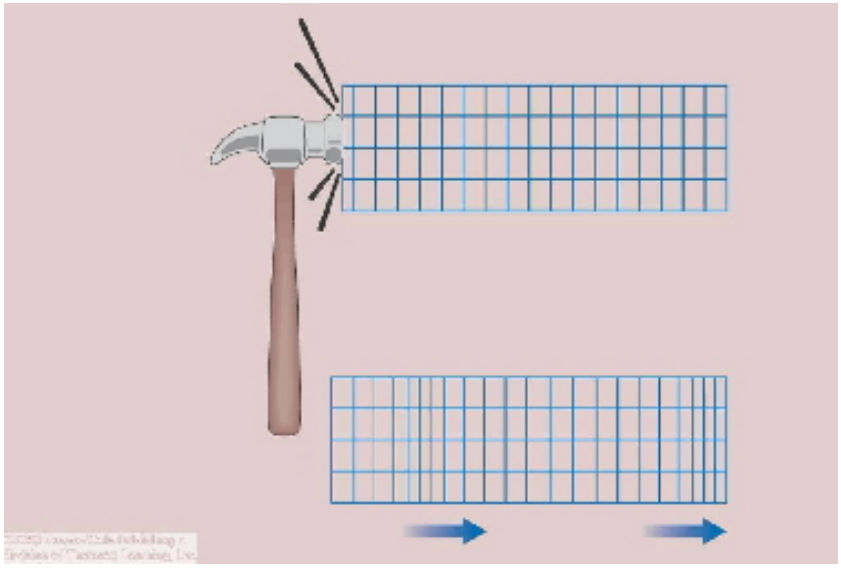
Plate Tectonics

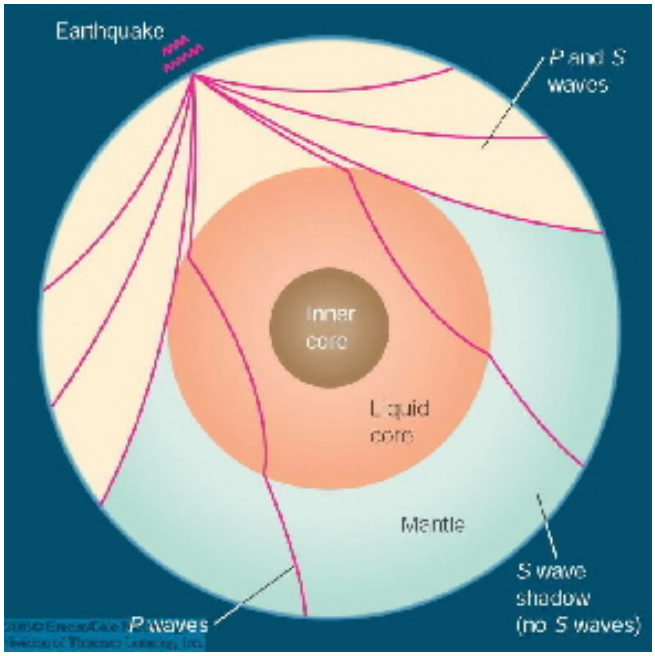
The lithosphere is the boundary between the crust and the mantle; consists of an upper layer of very-low-density rock plus the uppermost layers of the mantle

Plates move over the surface pushed along by convection currents in the mantle and neighboring plates

Earthquakes - S and P waves







Volcanos

Folded mountains are produced by collisions between plates - long, linear mountain ranges

Continental drift - 3 cm per year

Mid-Atlantic Ridge - young rock, new crust being created

Rift Valleys - Splitting of a continent

1.2.4 The Atmosphere

Early - Primeval atmosphere - hydrogen, helium, ammonia, and methane from the solar nebula

Later - Secondary atmosphere - outgassing from the interior while Earth differentiated, such as CO_2 and H_2O

Chemical reactions between the CO_2 being dissolve in the H_2O and in the sediments to produce limestone and silicone dioxide

Ultraviolet light broke up the methane, CH_4 and ammonia, NH_3 in the atmosphere, with the carbon combining with oxygen to form more CO_2 which is then dissolved in the oceans and the hydrogen escaping into space, leaving behind a surplus of nitrogen.

More oxygen was added by plant life which began in the oceans. Once the ozone layer was created, 25 kilometers up, life could spread out onto the land.

Table 20-1 | Earth's Atmosphere

Gas	Percent by Weight
N_2	75.5
O_2	23.1
Ar	1.29
CO_2	0.05
Ne	0.0013
He	0.00007
CH_4	0.0001
Kr	0.0003
H_2O (vapor)	1.7–0.06

1.2.5 The Greenhouse Effect

The atmosphere traps the heat absorbed by Earth not allowing it to escape into space.

The albedo of a planet is the amount of energy reflected back into space.

Venus - run-away greenhouse effect
Temperature everywhere on Venus is about 900 °C