

# Lithosphere

# Overview of the Lecture

- Size and shape of the Earth
- Earths structure
  - Core
  - Mantle
  - Crust
- Composition of Earths Crust
- Plates
- Plate Boundaries
- Biosphere

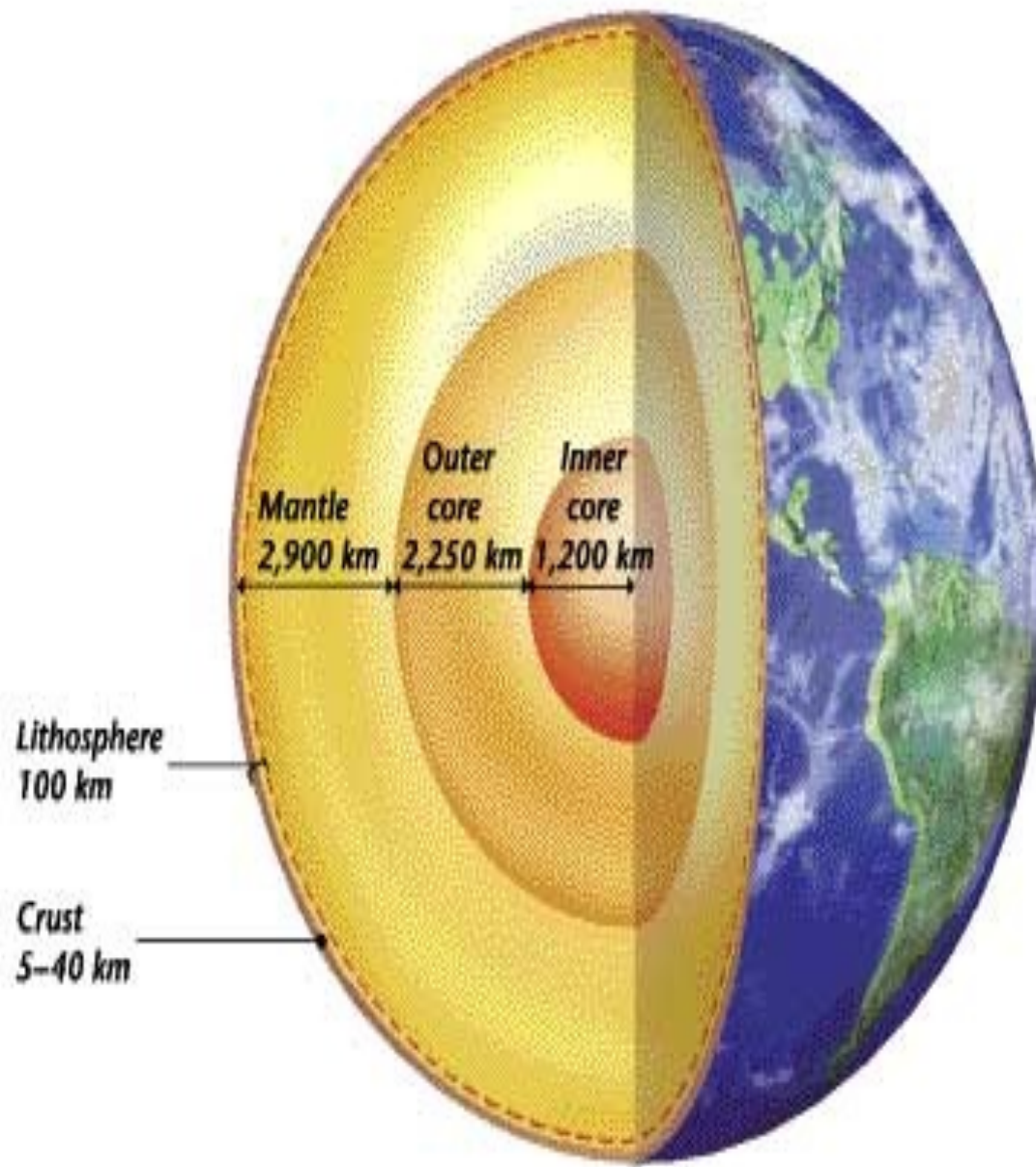
# Size and Shape of the Earth



- The Earth has a surface area of 510 million  $\text{km}^2$
- It is an oblate spheroid
- The study of the shape of the earth is called Geodesy
- Modern geodesic survey is greatly assisted by developments in remote sensing



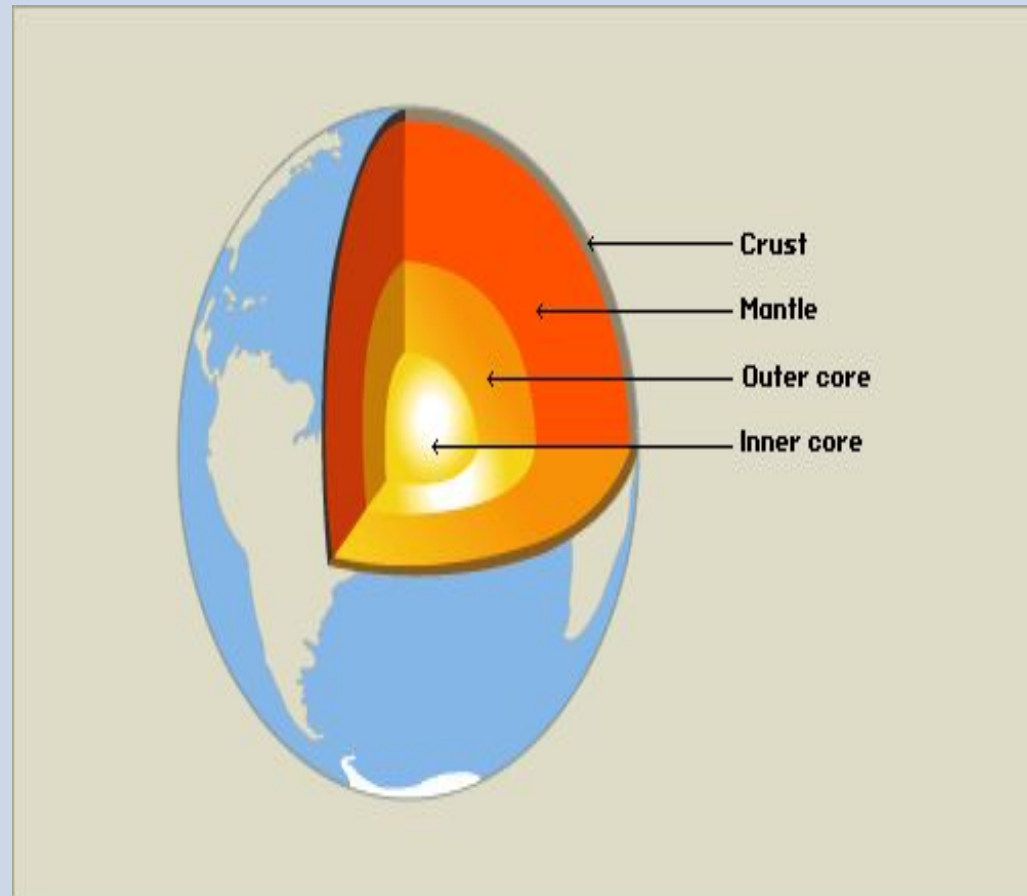
# Earth's Interior

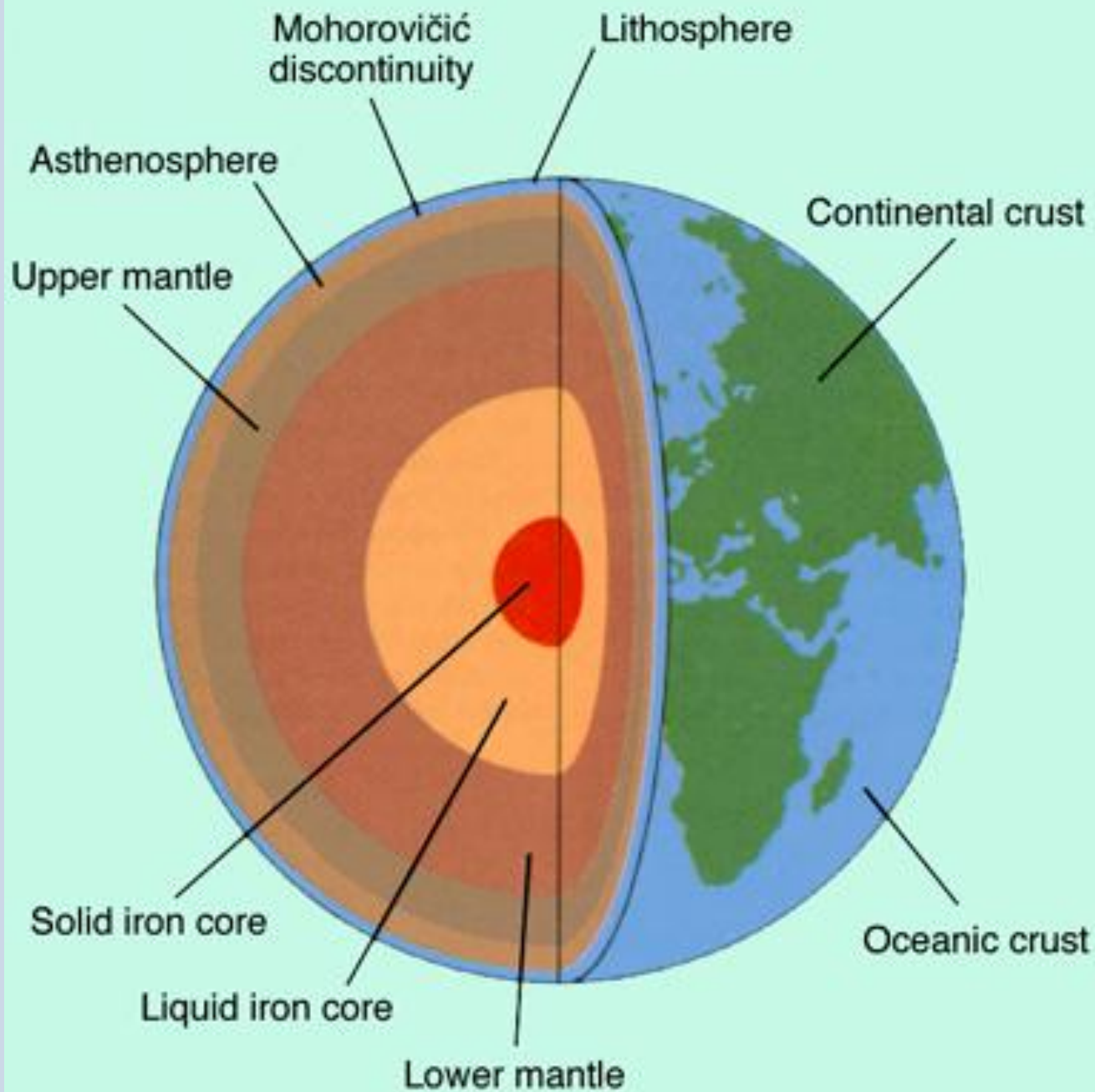


# Earth's Structure

## ■ Earth's internal zones:

- Core
  - Inner core
  - Outer core
- Mantle
- Crust
  - Oceanic crust
  - Continental crust





**Figure: Structure of the Earth**

- **Core**

- The inner most part of the earth
- Temperature of the centre of the core is between  $4000^{\circ}\text{C}$  &  $5000^{\circ}\text{C}$ .
- This part is composed of iron, nickel & cobalt & known as Nife.
- Density is very high
- It has two layers
  - a liquid exterior-outer core- 2250 km (thickness)-made of liquid Fe, Ni
  - a solid interior-inner core-1200 km (thickness)-made of solid Fe, Ni

- **Mantle**

- layer between the core & the crust
- a thick layer (2900 km) of mostly molten rock

**Lithosphere:** The outer part of the mantle is rigid and behaves as a solid and this layer mostly merges with the crust. Lithosphere consist of the crust and part of upper mantle, which is about 100 km thick. The lithosphere is the earth's solid crust and upper mantle. Lithosphere contains non-renewable fossil fuels and minerals we use as well as renewable soil chemicals that organisms need to live, grow and reproduce.

**Asthenosphere:** The layer just beneath the lithosphere is known as asthenosphere. Its materials behave more like flowing plastic than solid rock and is about 200 km thick.



- Crust
  - the outer shell of the earth which varies in thickness from 5-50 km.
  - It is solid & generally consists of low density materials
  - May be divided into two parts
    - upper crust/continental crust- up to 100 km thick under the mountains
    - lower crust/oceanic crust- only 5 km thick under the oceans
  - The upper crust is also known as 'sial' as rocks of this part is composed mainly of silica & aluminium.
  - The lower crust is called 'sima' as silica & magnesium are the most common minerals here.

# Composition of Earth's Crust

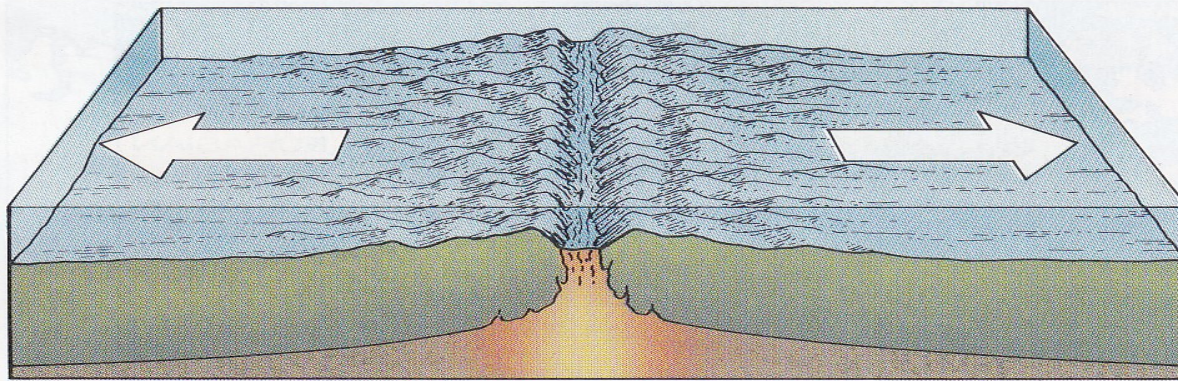
- Only 8 elements make up 99% of the weight of Earth's crust. These are, in order of abundance,
  - Oxygen 47%
  - Silicon 28%
  - Aluminum 8%
  - Iron 5%
  - Calcium 4%
  - Sodium 3%
  - Potassium 2%
  - Magnesium 2%
- All other elements make up only 1% of the weight of Earth's crust.

# Plates & Plate Tectonics

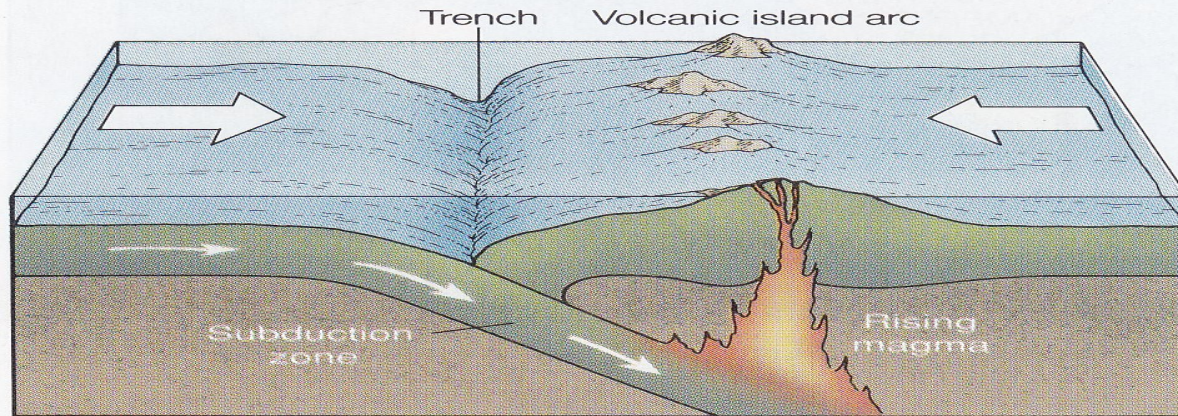
- **Plates:** Various-sized areas of Earth's lithosphere that moves slowly around on the mantle's flowing asthenosphere
- Earthquakes and volcanoes occur around the boundaries of these plates
- **Plate tectonics:** Theory of geophysical processes that explains the movements of Earth's plates and the processes that occur at their boundaries



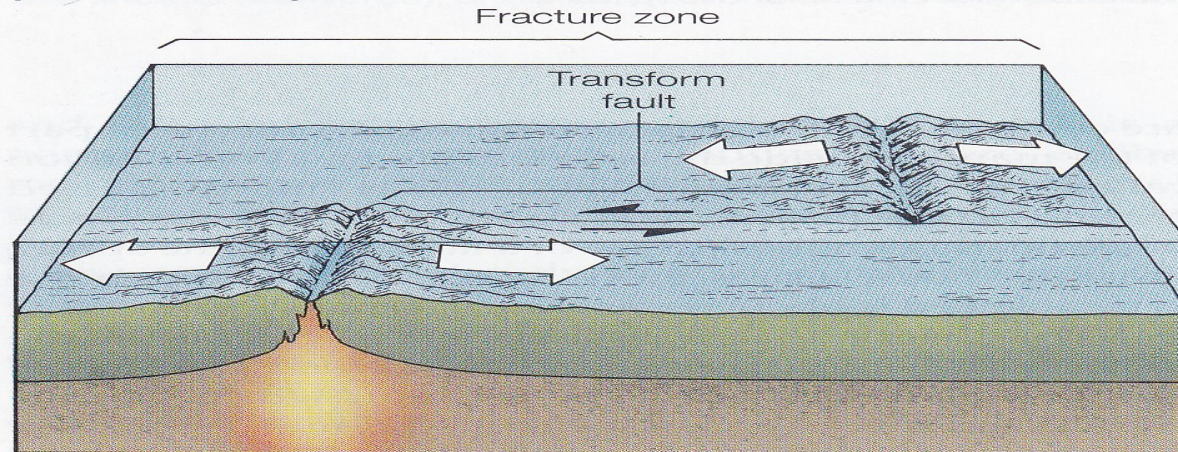
- Lithospheric plates have 3 types of boundaries:
  - Divergent
  - Convergent
  - Transform



**Oceanic ridge at divergent plate boundary**



**Trench and volcanic island arc at a convergent plate boundary**



**Transform fault connecting two divergent plate boundaries**

**Figure:**

**Types of boundaries  
between Earth's  
lithospheric plates.**

# Biosphere



- Zone of the Earth where life is found
- The biosphere consists of all living things, plant and animal
- Cycling of matter in this sphere involves not only metabolic reactions in organisms, but also many abiotic chemical reactions
- Also called Ecosphere

Biosphere extends from less than 11 km below sea level to the tropopause, which is less than 17km above sea level.

# Human Impacts on Biosphere

- Environmental pollution
- Habitat removal or damage
- Changing the structure and distribution of vegetation and soils
- Over exploitation of renewable resources
- Introducing exotic organism
- Inappropriate disposal of waste
- Disturbing the equilibrium of important environmental system

