

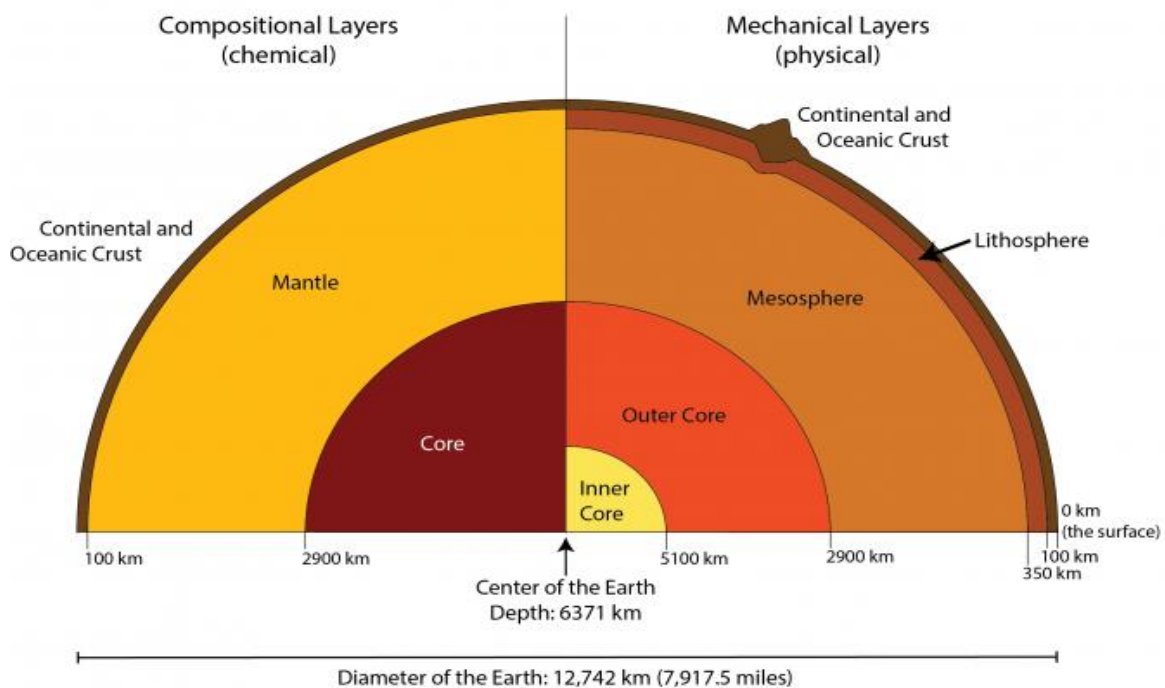
Internal Structure Of Earth

The Earth can be divided into one of two ways: mechanically or chemically.

Mechanically meaning the study of liquid states – it can be divided into the lithosphere, asthenosphere, mesospheric mantle, outer core, and the inner core.

But chemically or by composition, which is the more popular of the two, it can be divided into the crust, the mantle (which can be subdivided into the upper and lower mantle), and the core – which can also be subdivided into the outer core, and inner core.

Two different views of the interior of the Earth



Nooreen Meghani 2016

1. Crust:

The Crust Is The Outermost Solid And Thin Layer Of The Earth, With An Average Thickness Between 30 And 50 Km. Its Thickness Varies:

Oceanic Crust: 5–30 Km (Thinner, Composed Mainly Of Basalt).

Continental Crust: 50–70 Km, Reaching Up To 100 Km Under Major Mountain Ranges Like The Himalayas.

The Crust Makes Up Less Than 1% Of Earth's Mass And About 0.5–1% Of Its Volume.

The Temperature Increases With Depth, Reaching 200–400°C Near The Mantle Boundary, With A Gradient Of ~30°C/Km In The Upper Layers.

Chemical Composition:

Continental Crust: Light Silicates — Silica + Aluminum (Sial), Mainly Granite (Felsic).

Oceanic Crust: Heavy Silicates — Silica + Magnesium (Sima), Mainly Basalt (Mafic).

The Mohorovičić Discontinuity (Moho) Marks The Boundary Between The Lower Crust And The Upper Mantle.

2. The Mantle

Is The Thickest Layer Of The Earth, Located Between The Crust And The Core.

It Extends From The Mohorovičić Discontinuity (Moho) Down To About 2,900 Km In Depth And Makes Up About 84% Of Earth's Total Volume And 67% Of Its Mass.

Upper Mantle (Down To ~660 Km)

Includes The Asthenosphere (100–250 Km Deep): Partially Molten And Ductile Zone That Allows Tectonic Plates To Move.

The Uppermost Rigid Part, Together With The Crust, Forms The Lithosphere.

Lower Mantle (660–2,900 Km)

More Rigid Due To Higher Pressure.

Composed Of Minerals Such As Silicate Perovskite And Magnesiowüstite.

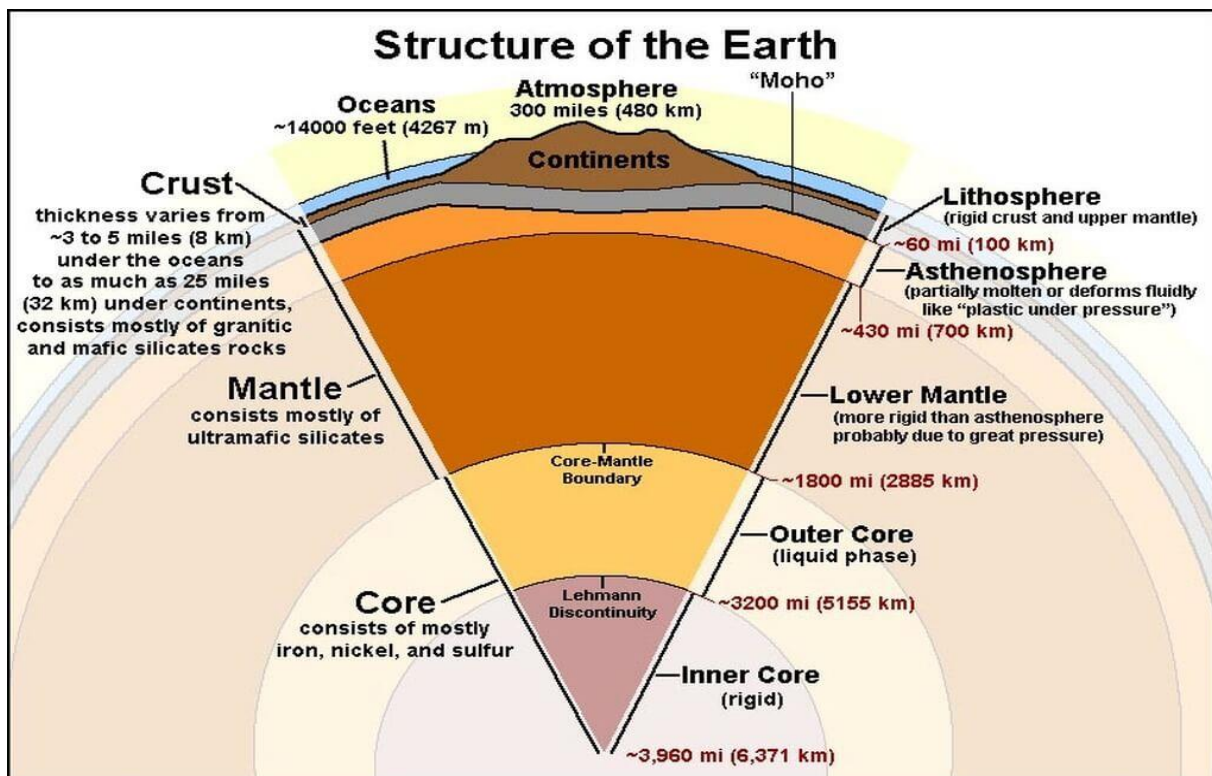
Heat Is Transferred Mainly By Convection Currents, Which Drive Plate Tectonics And Volcanic Activity.

Composition

Mainly Composed Of Silicate Minerals Rich In Iron (Fe) And Magnesium (Mg) — Collectively Known As Ultramafic Rocks.

The Dominant Minerals Include **Olivine, Pyroxenes, And Garnet.**

The Most Common Rock Type: **Peridotite**



Transition Zone

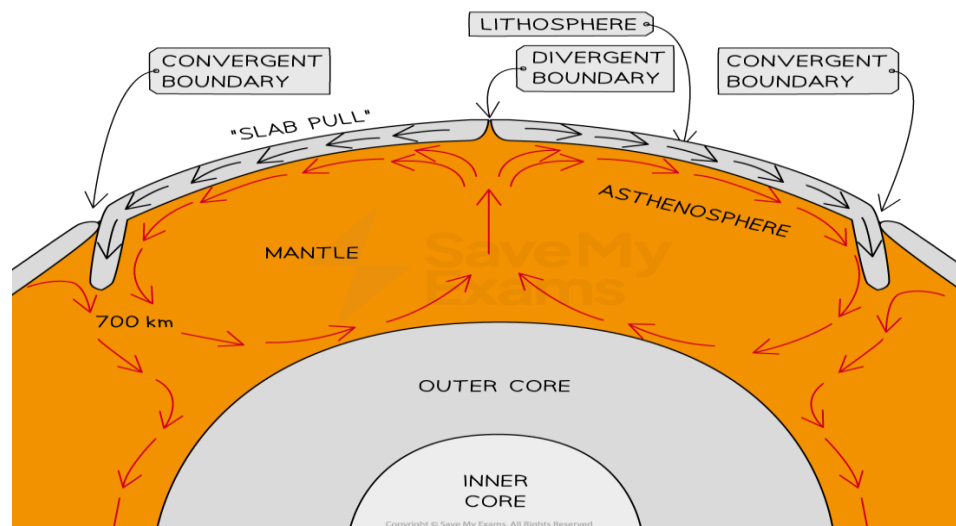
The **Transition Zone** Is A Distinct Layer Of The Earth's Interior, Lying **Between The Upper And Lower Mantle**, At Depths Ranging From **410 To 660 Kilometers** Beneath The Earth's Surface.

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The Transition Zone Acts As A **Buffer And Mixing Region** Between The Upper And Lower Mantle. It Plays A Crucial Role In **Mantle Convection, Magmatic Processes, And The Deep Water Cycle**, Possibly Storing As Much Water As All Earth's Oceans Combined

Convection Currents

The Earth's Internal Heat (About **5000–6000°C**) Is Produced Mainly By **Radioactive Decay** Of Elements Inside The Planet. This Heat Rises From The **Core** And Creates **Convection Currents** In The **Mantle** — Hot Material Rises, Cools Near The Surface, And Sinks Again.



Seismic waves and Earth's Layers- Seismic Discontinuities

Discontinuity Refers To A Sharp Boundary Between Layers In The Earth's Internal Structure. Across These Boundaries, Seismic Waves Undergo Significant Changes In Terms Of Their Direction And Speed.

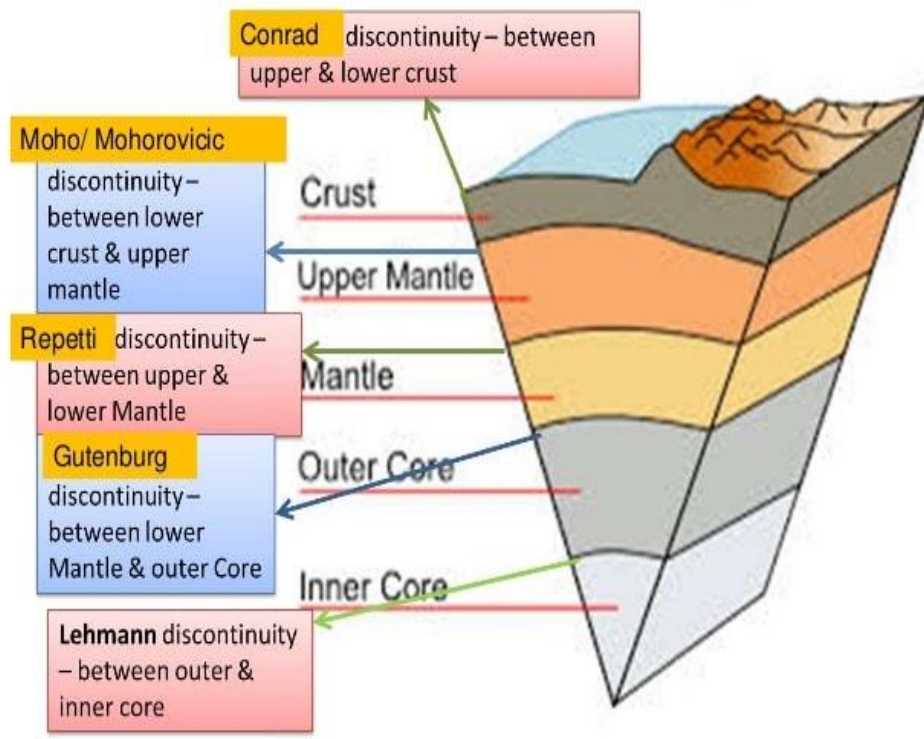
Mohorovicic Discontinuity (Moho) – Separates The Crust From The Mantle, Its Average Depth Being About 35 Km.

Repiti Discontinuity – Between The Upper And Lower Mantle

Gutenberg Discontinuity – Lies Between The Mantle And The Outer Core. Below 2900 Km From Earth's Surface.

- **Lehman Discontinuity**- Between Inner And Outer Core.

Seismic Discontinuity



3. Core :

3.1. Outer Core

- The outer core, which surrounds the inner core, is located between 2900 and 5100 kilometers beneath the surface of the planet.
- Iron with nickel and trace amounts of lighter metals make up the outer core.
- The outer core is liquid because it is not under enough pressure to solidify, despite having a comparable composition to the inner core.
- According to dynamo theory, Earth's magnetic field is created by convection in the outer core mixed with the Coriolis effect.

3.2. Inner Core

- The inner core stretches from the earth's center to 5100 kilometers below the surface.
- This layer is solid because it can transmit shear waves (transverse seismic waves). (When P-waves collide with the outer core – inner core border, S-waves result.)
- The rotation of the Earth's inner core is slightly quicker than the rotation of the surface.
- A persistent magnetic field cannot be maintained in the solid inner core because it is too hot.
- The core (inner core and outer core) makes up only around 16% of the earth's volume but accounts for 33% of its mass.