



“LAYERS UNVEILED: JOURNEY TO EARTH’S CORE”

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Abstract: The Earth, our home is the vastness of universe, holds secrets within its depths. This abstract provides a concise summary of the layers that compose our planet, shedding light on their composition, characteristics and significances. The Earth is composed of distinct layers that extend from its surface to its core starting with outermost layer the crust, we find both the continental and oceanic crusts, The crust is primarily made of solid rocks and minerals, and it varies in thickness across different regions

Beneath the crust lies the mantle, a layer that extends approximately 2,900 km deep. The mantle consists of solid rocks, which is rich in silicate minerals, and it experiences intense heat and pressure. The mantle’s convective currents drive plate tectonics and volcanic activity, shaping the Earth’s surface over millions of years.

Deeper still, we encounter the outer core, a liquid layer composed mainly of molten iron and nickel. It surrounds the solid inner core. The outer core’s high temperature and pressure sustain its liquid state and play a crucial role in generating Earth’s magnetic field.

At the centre of Earth lies the inner core, a solid sphere primarily composed of iron and nickel. Despite its extremely high temperature the inner core solid due to the immense pressure. It contributes to the Earth overall stability and structure.

Key Words :- *Crust, Mantle, Core.*

Introduction:

Imagine embarking on a captivating journey, peeling back the layers of our planet, and venturing deep into the enigmatic core of the Earth. This research paper explore the fascinating expedition titled “Layers Unveiled; Journey to Earth’s Core”, where we delve into the intricate realms beneath the Earth’s surface, uncovering the mysteries that lie within.

The earth’s layer holds secrets that spans millions of years, shaping the very fabric of our existence.

Our expedition begins with the crust, the outermost layer where continents and oceans meet, boasting diverse landscapes and bearing witness to the ever-changing face of our planet. From there, we venture deep into the mental, realm of intense heat and pressure, where molten rock dances and convective currents mould the Earth surface over vast periods of time.

As we penetrate further into the Earth’s depth, we encounter the mysterious outer core, a liquid sea of swirling iron and nickel, responsible for generating the protective magnetic field that shields us from solar winds. Finally at the heart of it all, we arrive at the inner core –a solid sphere of an imaginable heat and pressure, composed primarily of iron and nickel, holding the key to earth’s stability and structure.

Through this captivating journey, we aim to unravel the mysteries that lies within the layers of our planet, unlocking a deeper understanding it geological history, seismic activities, and the generation of Earth’s magnetic field.

Layers of Earth:

1.The Crust :Unveiling the surface

A . Definition and Composition:

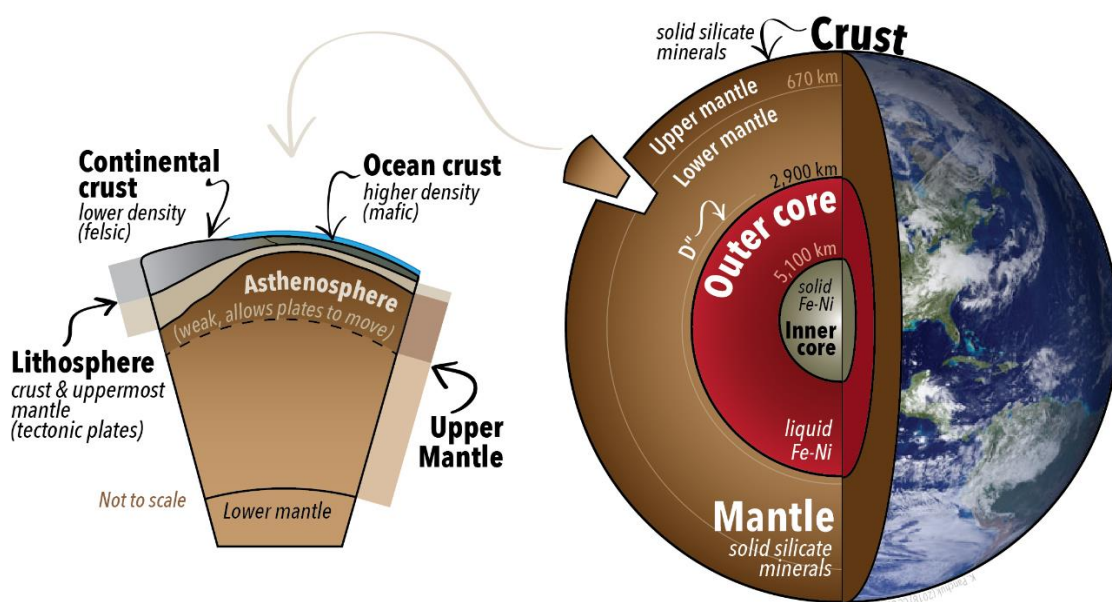
The crust is the Earth's outermost layer, encompassing both the continental and oceanic crusts. The continental crust is thicker and less dense than the oceanic crust. It primarily consists of granite, sedimentary rocks, and metamorphic rocks, making it less dense and lighter in colour. In contrast, the oceanic crust is thinner and denser, mainly composed of basalt and gabbro. Its formation occurs through volcanic activity at mid-ocean ridges. The key difference lies in their composition and thickness, with the continental crust being thicker and composed of different rocks, while the oceanic crust is thinner and predominantly basaltic in composition.

B. Characteristics and Features:

The crust, Earth's outermost layer, varies in thickness, typically ranging from 5 to 70 km. It is formed through various geological processes, including volcanic activity, tectonic plate movements, and sedimentation. The crust is responsible for the formation of prominent landforms such as mountains, valleys, and oceanic ridges. Mountains are uplifted regions, often formed by tectonic collisions or volcanic activity. Valleys are elongated lowlands, shaped by erosion or tectonic forces. Oceanic ridges are underwater mountain ranges formed at divergent plate boundaries, where new crust is generated.

C. Significance :

The crust plays a significant role in supporting life on Earth by providing a habitat for organisms and serving as a platform for human activities. It interacts with other layers, such as the mantle, through processes like plate tectonics, which shape landscapes, create volcanic activity, facilitate the recycling of essential elements. The crust is where we find valuable resources like minerals, water, and fossil fuels, making it vital for sustenance and development.



2. Mantle : Descending into the Depths

A. Definition and Composition :

The mantle, a layer beneath the crust, is a vast reservoir of solid rock and minerals that extends from the uppermost part of the mantle to its boundary with the core, composed primarily of silicate minerals rich in iron and magnesium. The mantle exhibits a solid-state behaviour under extreme pressure and temperature conditions. It is characterised by its semisolid, plastic-like consistency, capable of slowly flowing over geological time scales. The mantle plays a crucial role in Earth's geodynamics process driving plate tectonics, and influencing volcanic activity, as well as the

formation of mountain and ocean features . It is a key component in the intricate workings of our planets geological machinery.

B) Structure and divisions:-

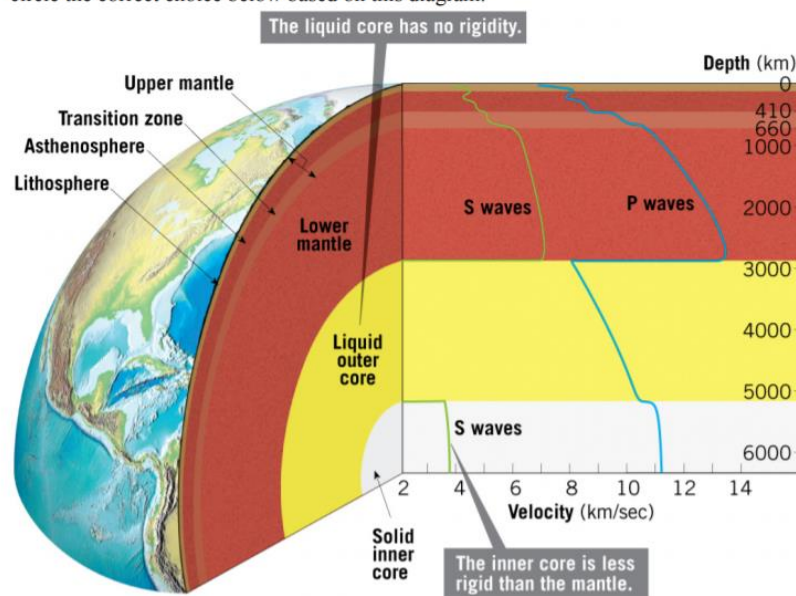
The mantle, located beneath the earth's crust ,can be divided into distinct zones : The Upper Mantle , Transition zone ,and lower Mantle.

The upper mantle is closest to the crust and exhibits relatively high temperature and pressure . It consists of solid rock and minerals ,and its movements contributes to plate tectonics .

The transition zone lies beneath to upper mantle and marks a region of increased pressure and mineral phase changes. This zone is characterised by the presence of different types of minerals, including garnet, which can accommodate higher pressure.

The lower mantle extends from the transition zone to the boundary with the core . It experiences immense pressure and temperatures , resulting in solid state flow of rock.

73. (8 points) The 1D seismic velocity structure of the Earth is shown below. Fill the blanks or circle the correct choice below based on this diagram.



These distinct zones of the mantle contributes to the complex behaviour of Earth's interior and play crucial rules in shaping the planet's surface and geophysical process.

3 . Core : Unravelling the Mysteries

The core is the inner most part of the Earth . It's a solid ball with a radius of about 1,200 km , which is about 20% OF Earth's radius or 70% of the Moons radius .It has two types .

Outer core and inner core

A . Outer core : The outer core , a liquid layer residing beneath the Earth's mantle , is predominantly composed of molten iron and nickel . This dynamic region plays a crucial role in generating Earth's magnetic field . The swirling motion of the electrically conductive outer core , driven by convective currents , gives rise to a phenomenon known as dynamo effect . This process generates a magnetic field that extends around the planet , protecting us from harmful solar radiations and guiding our compass needles .The outer core movement and its interaction with the solid inner core are fundamental to the existence and stability of Earth's magnetic shield , a vital aspect of our planet's geophysical dynamics .

B . Inner core : The inner core , nested with in the Earth's outer core , is a solid sphere primarily composed of iron and nickel . Despite extreme temperatures and pressures , it maintains a solid-state due to the immense pressure exerted upon it . The inner core's characteristics , such as its density and composition , contribute significantly to the overall structure of the Earth . It adds mass to the core , influencing planet's overall density and gravitational field .

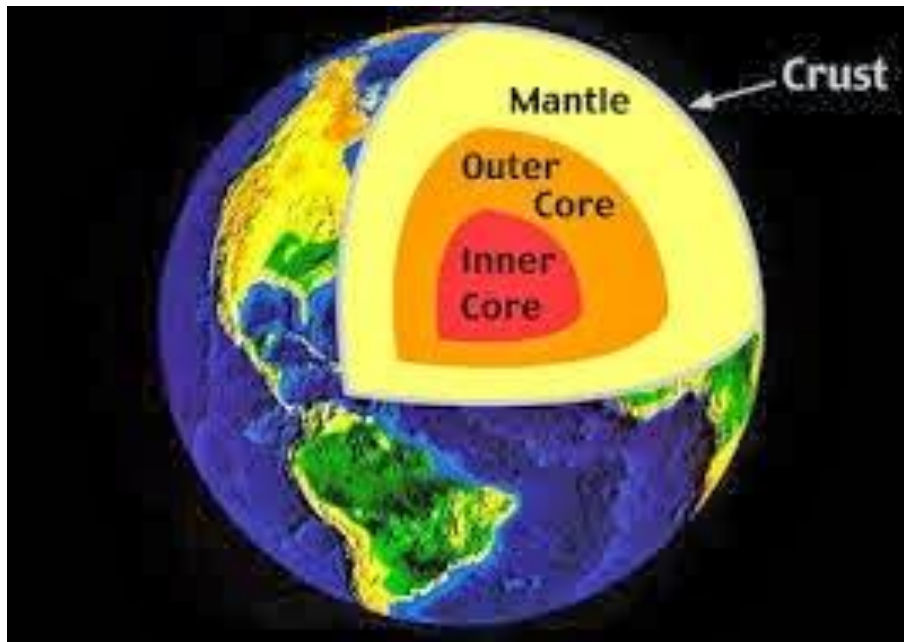


Fig ;Outer core and inner core.

Conclusion:

After an arduous and unprecedented journey, the layers of Earth's core were unveiled, unravelling the enigmatic depths of our planet. Revealing a mesmerizing tapestry of molten fury and ancient secrets, this expedition brought humanity closer to understanding the heart of our existence. The exploration not only expanded our scientific knowledge but also awakened a profound appreciation for the intricate layers that shape our world, forever transforming our perception of Earth's core.

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