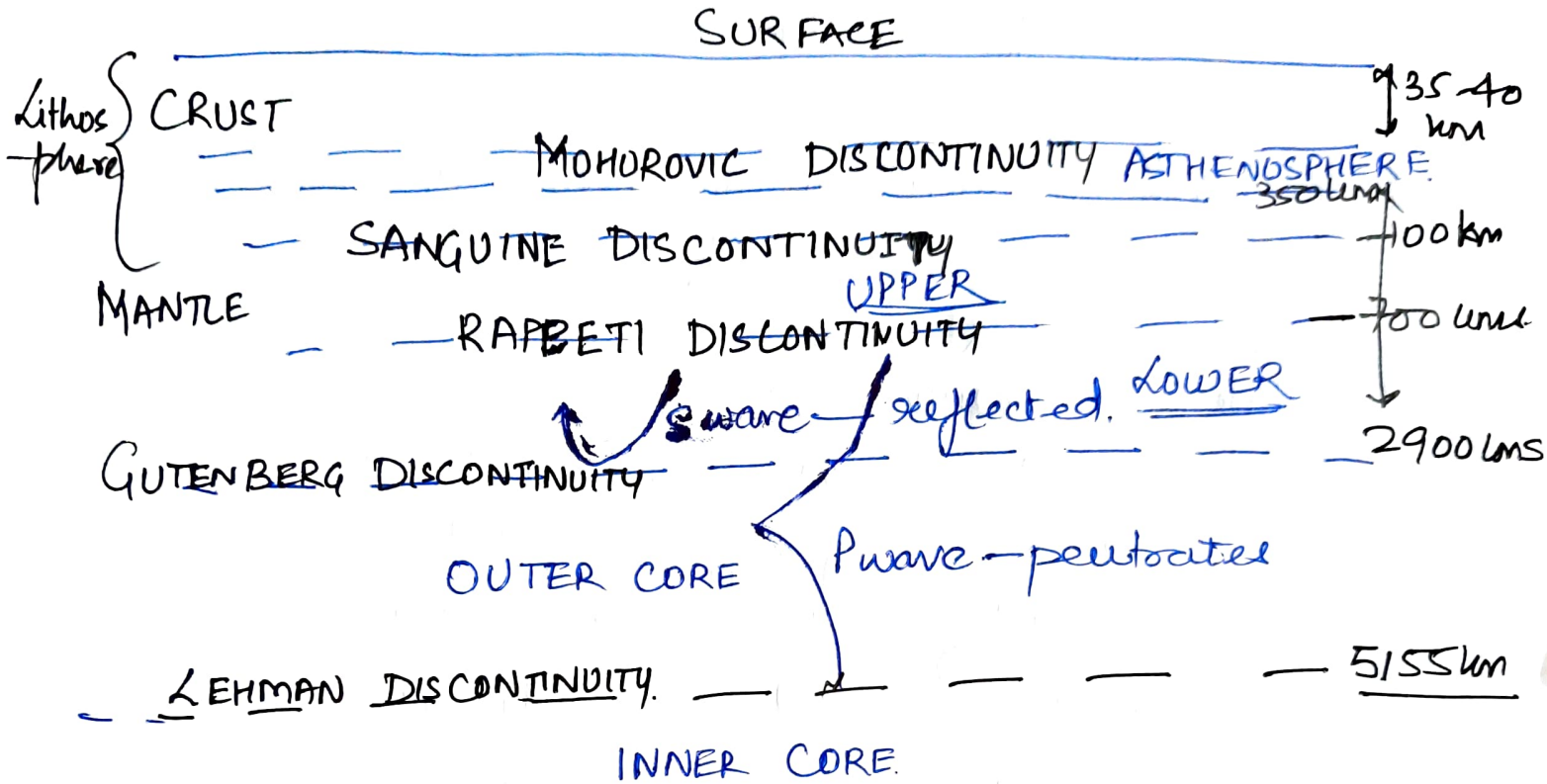
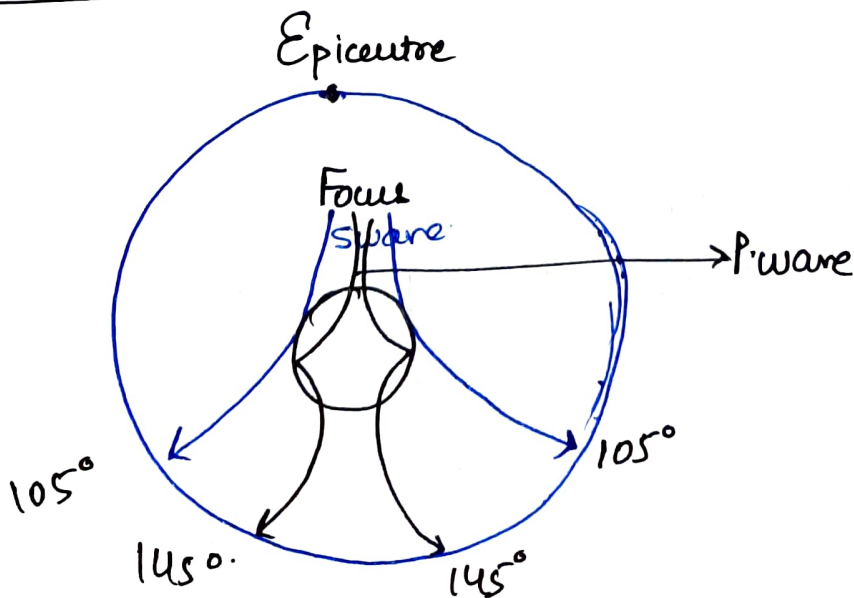


Layers of Earth



Earthquakes



## CRUST

It is the outermost shell of earth, geomorphologically, characterized into continental and oceanic layer.

Continental crust contains substantial amount of silica, having the depth of 30-60 km from the surface. The uppermost layer of crust is sedimentary. In composition and below this sedimentary layer, there is a layer of crystalline rock. having granite & gneisses.

On the other hand, oceanic crust is much more shallower, having the depth b/w 5-10 km from the surface, characterized by absence of upper sedimentary layer, presence of Basaltic igneous rock. Oceanic crust is much more denser ( $3 \text{ gm/cm}^3$ ) than continental layer ( $2.7 \text{ gm/cm}^3$ ).

At the depth of 35-40 km, some anomalies and changes are identified in the wave propagation based on which the intermediate layer of earth is identified and is called as MANTLE.

## MANTLE (35-2900 km)

The zone of mantle is further characterized into two more concentrated layers - upper and lower mantle. The average density of upper mantle is b/w 3.5 to 4 and lower mantle where temp. rises upto 3300 km has density b/w  $4.5-5 \text{ gm/cm}^3$ .

(2)

The layer of earth extended approx upto 100 km comprising 35 km of crust and 65 km of upper mantle is made up of rigid rock strata and regarded as lithosphere. Below, this brittle zone of lithosphere lies the semi-molten plastic asthenosphere. It should be noted that the asthenosphere is also regarded as low velocity zone and magma chamber of earth. It is also a well established argument that oceanic lithosphere is 90% mantle while continental lithosphere contains 60% of intermediate matter / upper mantle.

At the depth of 2900 km, one more transitional zone has been identified in the wave propagation, where S wave gets reflected from the boundary but P wave is able to percolate below this boundary. Based on this, the most intrinsic layer of earth gets the demarcation as CORE

## CORE

(2900 - upto centre of earth)  
km

The zone of outer core is semi liquid in nature, where the temp rises upto  $4300^{\circ}\text{C}$ . It mainly contains iron alloy with less % of lighter elements like oxygen sulphur and nickel. Outer core also acts as a giant self existing dynamo in which rising convectional currents of liquid iron carry.



electric currents which interact with earth's magnetic field.

Below the semi liquid layer of outer core, lies the solid inner core. Despite of intense thermal condition ( $6000^{\circ}\text{C}$ ) the core of inner core is solid in composition due to two possible geological and geomorphological factors.

First; the superimposed pressure over inner core is 3 times more than that of outer core. Here the pressure factor nullify the temp factor and second, inner core is characterized by the composition of / concentration of heavy metals with high melting points (Iron and Nickel).

## CONTINENTAL DRIFT THEORY

It was proposed by Alfred Wegner in 1912, with the objective to find out different type of climatological changes that had taken place over the surface of earth during the different geological time scales. The theory was able to provide some evidences about, the present configuration of first order and formation of some second order physical features.

The theory of continental displacement was based on two findings, two assumptions and three perceptions. (3)  
During his expedition he found the evidence of glaciation near equator and deposits of coal in polar <sup>sub-</sup>high latitudes. Based on this, he propounded the assumption that, Climatic zones are almost stationary but regular drifting and displacement of continental blocks had taken place during different geological time scales. To operationalise, this assumption of continental drifting, he further proposed 3 new perceptions in support of his theory;

- ① During Carboniferous period (2 mya) all the continental blocks were united together in the form of a composite whole called Pangea surrounded by the ~~Panthalassa~~ Panthalassa. According to Wegner, all the present continental columns and water basins are nothing but the segregated sections and remains of pangea and panthalassa resp.
- ② Continental slabs were floating over oceanic seamounts without any obstacles.
- ③ There were several shallow water bodies within united pangea and most prominent was Tethys ~~geosyncline~~ geosyncline. This geosyncline segregated the pangea into the blocks of Angara and Gondwana land.



## Mechanism of Continental Drift theory

According to Wegner, the disruption, drifting and eventually drifting of united pangea had taken place under the influence of 3 sequential forces; Buoyancy upthrust, differentiated gravitational force and tidal force.

According to Wegner, during the Carboniferous era, the segregation of united pangea had taken place into the blocks of Angara and Gondwana land, by the sequential buoyancy upthrust which remained applicable in the centre of composite pangea. The result of segregation was the creation of ~~the~~ Tethys geosyncline b/w the blocks.

After the resultant impact of buoyancy upthrust, the differentiated gravitational attraction become applicable, by which the segregated blocks again came closer to each other. Wegner referred to this as. pole wandering since the segregation of African block had taken place from Antarctica at the same time and drifting of movement of Africa had also taken <sup>away the</sup> pole.

The sequential attraction caused by gravitation, also (4) uplifted the margins of Angara and Gondwana land as young fold mountains; Alps, Atlas and Himalayas etc.

After the resultant impact of respective forces, the tidal attraction of celestial bodies remained operative over surface of earth. Consequently, the segregation of Angara and Gondwana land has taken place into small-small continental sections and all these disrupted blocks of Pangea also start drifting towards west over Sima of Panthalassa. This westward drifting of continental columns was identified by Wegner as Continental Drifting.

Since the rate of disruption and drifting was not uniform some blocks able to move at a high rate and some block lagged behind against the faster moving westward blocks. Subsequently, intervening space was created b/w the respective blocks, which was filled by water mass of Panthalassa. In this way, the configuration of first order relief features evolved over the surface of earth.

The continental drift was substantial in evidences,  
but unrealistic in mechanism. The mechanism based  
on three sequential forces was ~~refuted~~ rejected by the  
later scholars based on its objectivity and practical  
application. In the course of time, thermal convection  
theory was <sup>proposed</sup> ~~opposed~~ by Arthur Holmes as a reformatory  
version of continental drift theory with the purpose to  
overcome the limitations and with the objective to provide  
several evidences about endogenetic forces and formation  
of several ~~surface~~ features over the surface of the earth.