Vigyan Samachar: MoES News
03/01/2020

Bizarre ‘Snowflake’ like 320 km thick layer of tiny iron particles observed at the hot inner core of Earth

A new research finding by the researchers at Jackson School of Geosciences at The University of Texas at Austin suggests that **unlike our previous understanding of the earth's inner core, that the inner core of Earth entirely consists of solid magma, the hot inner core is actually covered with a 200 miles thick tiny particles of iron that fall from the molten outer core and pile on top of the solid inner core like snowflakes.**

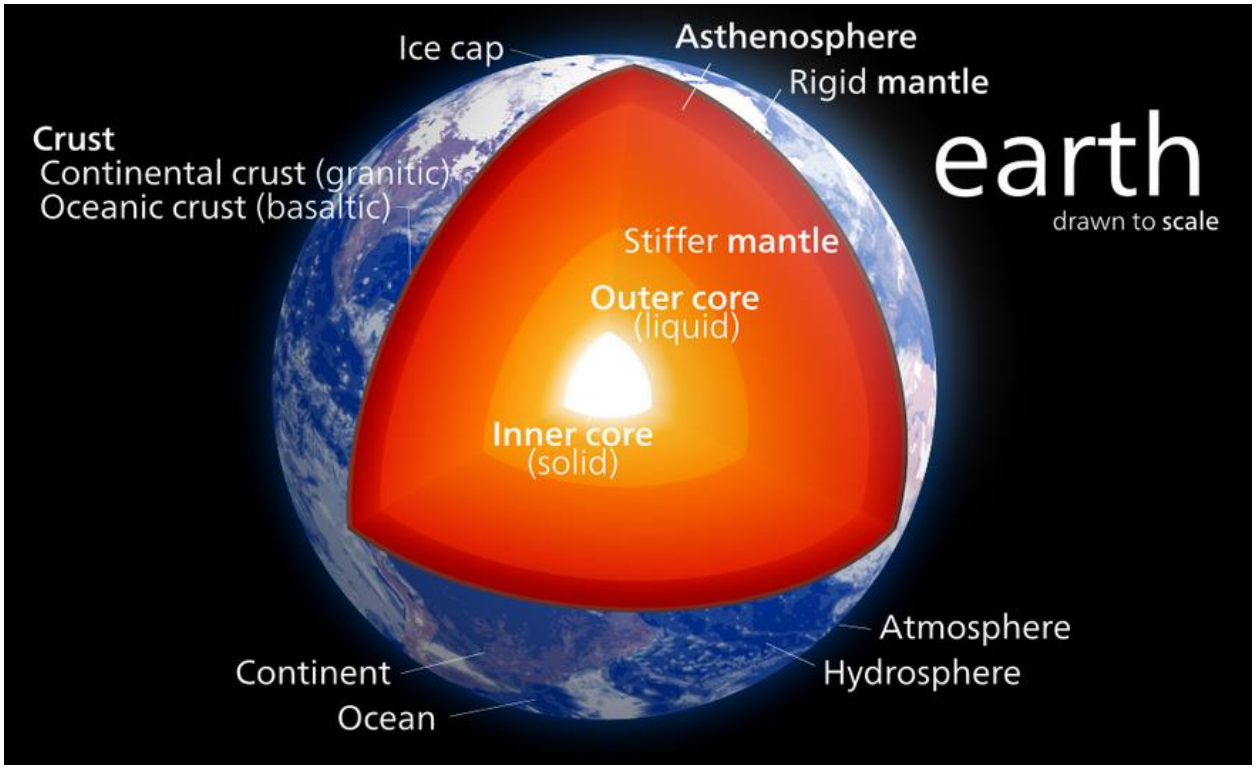
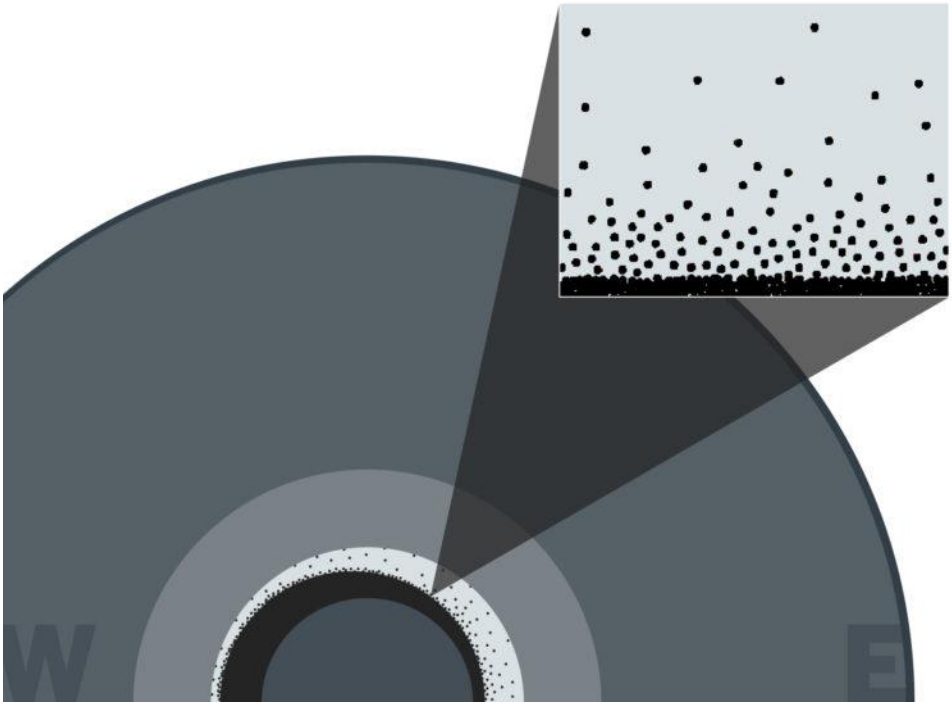


Image Credit: Wikipedia

These tiny particles of iron are much heavier than any snowflake on Earth's surface -- that fall from the molten outer core and pile up on top of the hot inner core. The result is the formation of a layer of iron particles as thick as 200 miles covering the solid inner core which has a temperature of about 5430 °C (which is about the temperature at the surface of the Sun).

This is something bizarre and the researchers say it is like an **"Alien Winter Wonderland"!**

It is however something akin to how rocks form inside volcanoes too.



A figure illustrating how iron “snow” falls from the outer core and piles on the inner core. Credit: UT Austin/Jackson School of Geosciences

As the Earth's inner core can't be sampled, scientists study it by recording and analyzing signals from seismic waves (a type of energy wave) as they pass through the Earth. Earth's inner core is the innermost geologic layer of the Earth. It is primarily a solid ball with a radius of about 1,220 kilometres (760 miles), which is about 20% of the Earth's radius or 70% of the Moon's radius.

No samples of the Earth's inner most core is so far available for direct measurement unlike the Earth's mantle. So the information about the Earth's core mostly comes from analysis of seismic waves and the magnetic field.

The inner core is believed to be composed of an iron–nickel alloy with some other elements. **The study at the Jackson School of Geosciences at The University of Texas at Austin proposes the iron snow-capped core after observing the aberrations between recent seismic wave data and the values that would be expected based on the current model of the Earth's core.** The waves move more slowly than expected as they passed through the base of the outer core, and they move faster than expected when moving through the eastern hemisphere of the top inner core.

S.I. Braginkskii - One of the early scientists proposed during 1960s that a slurry layer exists between the inner and outer core, but prevailing knowledge about heat and pressure conditions in the core environment quashed that theory.

Now this new data from experiments on core-like materials conducted by the scientists at University of Texas found that crystallization was possible and that about 15% of the lowermost outer core could be made of iron-based crystals that eventually fall down the liquid outer core and settle on top of the solid inner core. One of the scientists involved in the research said, "You have crystals within the outer core snowing down onto the inner core over a distance of several hundred kilometers."

In the Earth's core, the condensation of iron contributes to the development of the inner core and the shrinking of the outer core. And given the core's influence on the phenomenon that affects the entire planet, from generating its magnetic field to radiating heat that drives the movement of tectonic plates, understanding more about its structure and behavior would help scientists better understand forces that affect the entire planet.

It is expected that similar research would be carried out by seismic scientists in India to find out more information on the nature of the inner core of Earth.

Dr. Mohammad Faiyaz Anwar
Project Scientist, Vigyan Prasar