Science & Environment

New idea tackles Earth core puzzle

By Simon Redfern
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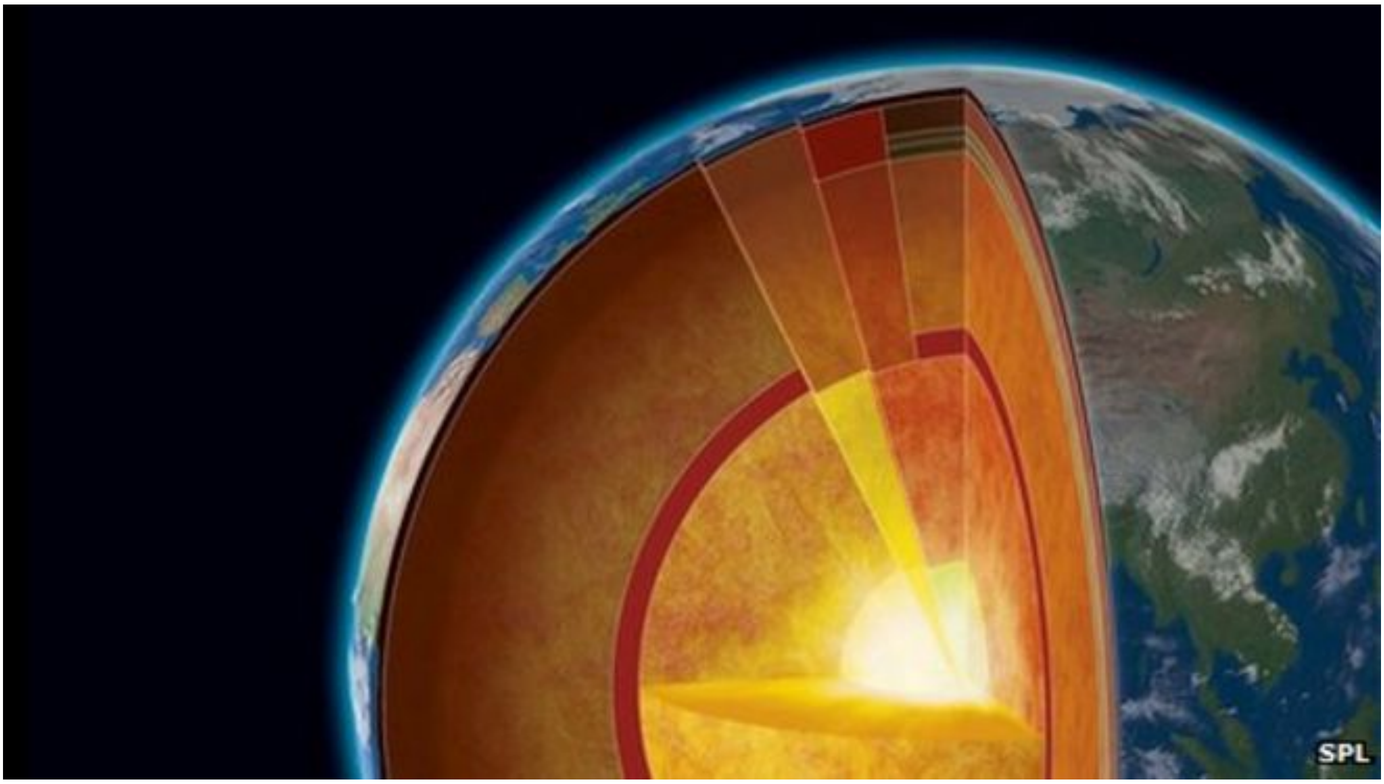

Lying 5,000km beneath our feet, the core is beyond the reach of direct investigation

Scientists have proposed a radical new model for the make-up of the Earth's core.

The study may explain a longstanding puzzle about the most inaccessible part of our planet.

It suggests that differences between the east and west hemispheres of the core are explained by the way iron atoms pack together.

Details appear in the journal **Scientific Reports**.

Lying more than 5,000km beneath our feet, at the centre of the Earth, the core is beyond the reach of direct investigation. Broadly speaking, it consists of a solid sphere of metal sitting within a liquid outer core.

The inner core started to solidify more than a billion years ago. It has a radius of about 1,220km, but is growing by about 0.5mm each year.

But the stuff that the core is made from remains a longstanding unresolved problem.

Clues come from the speeds that seismic waves generated by earthquakes pass through the core.

These tell us its density and elasticity, but the precise arrangement of iron atoms forming the crystalline core controls these numbers.

How those atoms are arranged remains unclear, since the conditions of extreme pressure and temperature at the core cannot easily be replicated in the laboratory.

Seismic data indicate that the western and eastern hemispheres of Earth's inner core differ, and this has led some to suggest that the core was once subjected to an impulse - presumably from the collision of a space rock or planetoid which shook the whole Earth.

The core, it is suggested, is constantly moving sideways. As it does, the front side is melting and the rear side crystallising, but the core is held centrally by gravity.

With all these seismic complexities, the link between the crystal structure and the geophysical observations has yet to be resolved.

In Scientific Reports, Maurizio Mattesini from the Complutense University of Madrid, Spain, and colleagues propose a novel possibility for the structure of the core: that it is composed of mixtures of different iron arrangements distinguished by the way their atoms pack together.

By comparing seismic data from over one thousand earthquakes across the globe with quantum mechanical models for the properties of iron, they suggest that seismic variations directly reflect variations in the iron structure.

They propose that the eastern and western sides of the core differ in the extent of mixing of these distinct structures, and suggest their results account for the dynamic eastward drift of the core through time.

Their complicated picture of the core contrasts with earlier suggestions of a more uniform mineralogy. It has yet to incorporate the effects of minor amounts of other elements in the iron alloy actually thought to be there.

But Dr Arwen Deuss, a seismologist from the University of Cambridge, commented: "This is a step in the right direction, directly comparing seismology with mineral physical properties." She added that it should eventually provide a better understanding of the birth and evolution of our planet.

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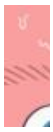

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