

Study may solve age-old mystery of missing chemicals from Earth's mantle

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Observations about the early formation of Earth may answer an age-old question about why the planet's mantle is missing some of the matter that should be present, according to UBC geophysicist John Hernlund.

Earth is made from chondrite, very primitive rocks of meteorites that date from the earliest time of the solar system before the Earth was formed. However, scientists have been puzzled why the composition of Earth's mantle and core differed from that of chondrite.

Hernlund's findings suggest that an ancient magma ocean swirled beneath the Earth's surface and would account for the discrepancy.

"As the thick melted rock cooled and crystallized, the solids that resulted had a different composition than the melt," explains Hernlund, a post-doctoral fellow at UBC Earth and Ocean Sciences.

"The melt held onto some of the elements. This would be where the missing elements of chondrite are stored."

He says this layer of molten rock would have been around 1,000 km thick and 2,900 km beneath the surface."

Published in today's edition of the journal *Nature*, Hernlund's study explores the melting and crystallization processes that have controlled the composition of the Earth's interior over geological time. Co-authors are Stéphane Labrosse, Ecole Normale Supérieure de Lyon and Nicolas

Coltice, Université de Lyon.

The centre of Earth is a fiery core of melted heavy metals, mostly iron. This represents 30 per cent while the remaining 70 per cent is the outer mantle of solid rock.

Traditional views hold that a shallow ocean of melted rock (magma) existed 1,000 km below the Earth's surface, but it was short lived and gone by 10 million years after the formation of Earth.

In contrast, Hernlund's evolutionary model predicts that during Earth's hotter past shortly after its formation 4.5 billion years ago, at least one-third of the mantle closest to the core was also melted.

Source: University of British Columbia

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