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ON THE TRACKS OF THE EARTH'S MANTLE HELIUM

Relevant for: World & Indian Geography | Topic: Important Geophysical phenomena - Earthquakes, Tsunamis & Volcanoes

Helium – the second most abundant element in the universe – is hard to come by on Earth in its gaseous state, because it is so light that it can escape easily. But one of the places where it is found is in volcanic lava plumes, such as seen in Iceland and Hawaii, originating from the Earth's mantle. This is ancient helium from when the Earth was formed. It is believed to be trapped in compounds deep within the earth. However, the nature of these compounds have so far remained a mystery.

Now a group of researchers has come up with a striking possibility that the mantle helium must exist as the compound FeO2He which is stable and solid under the pressure and temperature conditions prevailing at those depths.

The team used a crystal search algorithm CALYPSO which they had developed, to look at possible compounds containing helium. If the energy of the suggested compound containing helium was lower than that of free helium, then the compound state would be considered favoured and the algorithm would give a positive answer. In this manner, looking at many hypothetical magnesium and iron based compounds, the team came up with just one possibility – FeO2He.

Their calculations showed that this compound is stable at temperatures between 3000 K and 5000 K and at pressures between 135 and 300 GPa. These conditions correspond to those found in the core–mantle boundary.

If this result is proved right by experiment, it will solve the longstanding problem of where ancient helium is stored within the Earth.

Military communication satellite GSAT-7A, due to be launched on December 19 evening from Sriharikota, is expected to add a new space-based dimension

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