Researchers unlock mystery of layer encircling the Earth's core

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University of Minnesota associate professor of chemical engineering Renata Wentzcovitch and her team of researchers have confirmed the properties of a mineral (post-perovskite) that may form near the Earth's core in a layer called the D'' region.

The work offers new insight for interpreting properties of this region. The D'' (Dee double prime) layer surrounds Earth's core and is between

0 and 186 miles thick. It is at the interface between two chemically distinct regions, the rocky mantle and the metallic core. The article, "MgSiO3 post-perovskite at D'' conditions," was published on Jan. 17 in *Proceedings of the National Academy of Science*.

The research "tells us how to better model Earth's internal processes," said Wentzcovitch. "Proper geodynamical modeling of the Earth is necessary to get a better grasp of the dynamics of the surface. You can't fully understand Earth's surface motion without understanding how it moves inside. What's unbelievable is how well we can model Earth on a big scale. At this scale, small details don't matter."

In 2004, Japanese researchers at the Tokyo Institute of Technology found that high temperatures and pressures transform perovskite, the major mineral in Earth's mantle, into a new mineral called post-perovskite. Wentzcovitch's group contributed to this discovery by determining the structure of post-perovskite and by calculating the pressure and temperature conditions for its existence. They matched the conditions in the D'' layer.

In the current work, Wentzcovitch and colleagues demonstrate that the seismic properties of post-perovskite are much like the previously inexplicable properties found in the D'' layer. This is the most convincing evidence that post-perovskite is in the D'' layer and produces its strange seismic properties.

"As the Earth cools, D'' becomes thicker. Its thickness is related to Earth's age and its aging processes. The discovery of post-perovskite in the D'' layer will also help us understand how the Earth has evolved," Wenttzcovitch said.

On the web: www.pnas.org/content/vol103/issue3/#GEOPHYSICS

Source: University of Minnesota