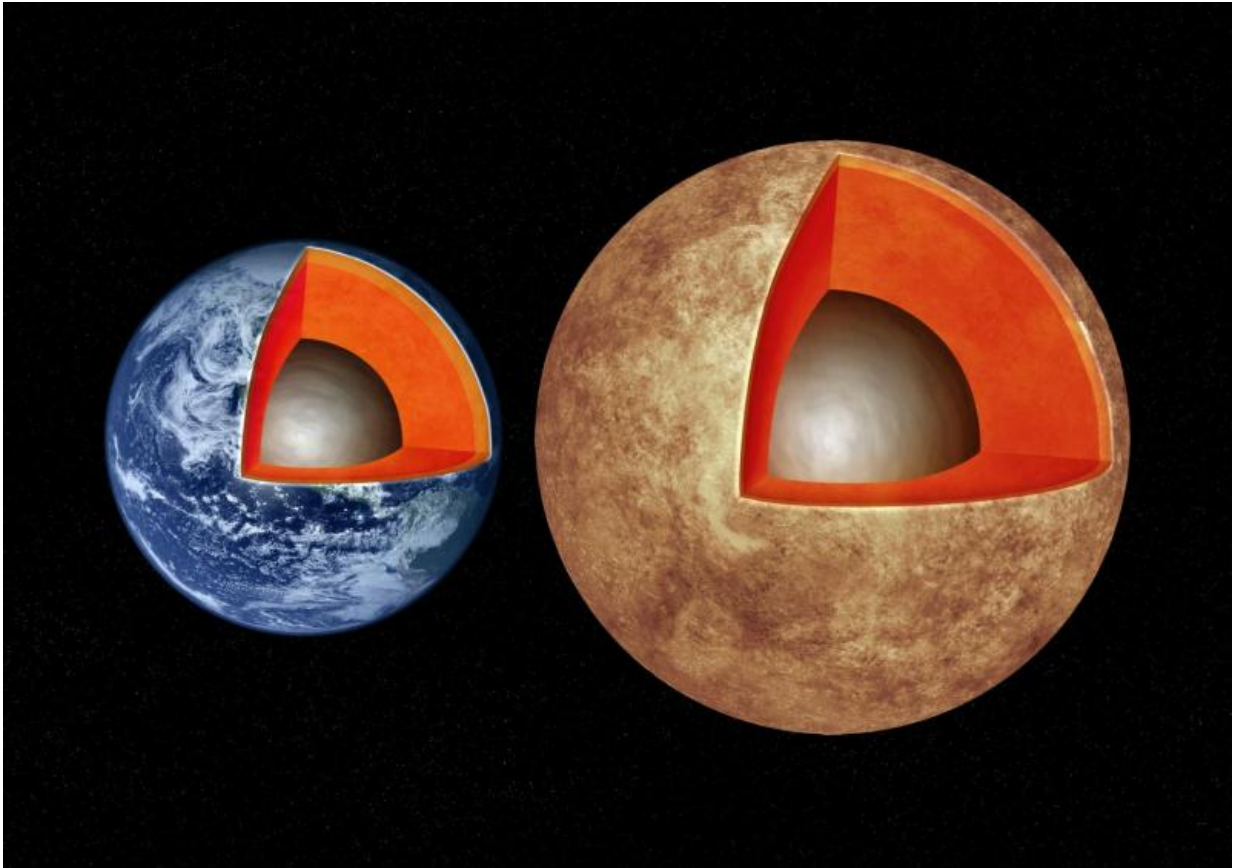


Earth-like planets have Earth-like interiors

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Credit: Harvard-Smithsonian Center for Astrophysics

Every school kid learns the basic structure of the Earth: a thin outer crust, a thick mantle, and a Mars-sized core. But is this structure universal? Will rocky exoplanets orbiting other stars have the same three layers? New research suggests that the answer is yes - they will have

interiors very similar to Earth.

"We wanted to see how Earth-like these [rocky planets](#) are. It turns out they are very Earth-like," says lead author Li Zeng of the Harvard-Smithsonian Center for Astrophysics (CfA).

To reach this conclusion Zeng and his co-authors applied a computer model known as the Preliminary Reference Earth Model (PREM), which is the standard model for Earth's interior. They adjusted it to accommodate different masses and compositions, and applied it to six known rocky exoplanets with well-measured masses and physical sizes.

They found that the other planets, despite their differences from Earth, all should have a nickel/iron core containing about 30 percent of the planet's mass. In comparison, about a third of the Earth's mass is in its core. The remainder of each planet would be mantle and crust, just as with Earth.

"We've only understood the Earth's structure for the past hundred years. Now we can calculate the structures of planets orbiting other stars, even though we can't visit them," adds Zeng.

The new code also can be applied to smaller, icier worlds like the moons and [dwarf planets](#) in the outer solar system. For example, by plugging in the mass and size of Pluto, the team finds that Pluto is about one-third ice (mostly water ice but also ammonia and methane ices).

The model assumes that distant exoplanets have chemical compositions similar to Earth. This is reasonable based on the relevant abundances of key chemical elements like iron, magnesium, silicon, and oxygen in nearby systems. However, [planets](#) forming in more or less metal-rich regions of the galaxy could show different interior structures. The team expects to explore these questions in future research.

The paper detailing this work, authored by Li Zeng, Dimitar Sasselov, and Stein Jacobsen (Harvard University), has been accepted for publication in The *Astrophysical Journal* and is available online.

More information: "Mass-Radius Relation for Rocky Planets Based on PREM," Li Zeng, Dimitar Sasselov & Stein Jacobsen (Harvard University), 2016, accepted for publication in the *Astrophysical Journal* arxiv.org/abs/1512.08827

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