Plate tectonics may have been active on Earth since the very beginning

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For the research, Dygert and his team looked into the distribution of two very specific noble gas isotopes: Helium-3 and Neon-22. Noble gases are those that don't react to any other chemical element.

Previous models have explained the Earth's current Helium-3/Neon-22 ratio by arguing that a series of large-scale impacts (like the one that produced our moon) resulted in massive magma oceans, which degassed and incrementally increased the ratio of the Earth each time.

However, Dygert believes the scenario is unlikely.

"While there is no conclusive evidence that this didn't happen," he said, "it could have only raised the Earth's Helium-3/Neon-22 ratio under very specific conditions."

Instead, Dygert and his team believe the Helium-3/Neon-22 ratio raised in a different way.

As the Earth's crust is continuously formed, the ratio of helium to neon in the mantle beneath the crust increases. By calculating this ratio in the mantle beneath the crust, and considering how this process would affect the bulk Earth over long periods of time, a rough timeline of Earth's tectonic plate cycling can be established.

"Helium-3 and Neon-22 were produced during the formation of the solar system and not by other means," Dygert said. "As such, they provide valuable insight into Earth's earliest conditions and subsequent geologic activity."
