More evidence found showing the moon's inner core is solid, like Earth's

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A small team of astronomers at Université Côte d'Azur, Observatoire de la Côte d'Azur, working with a colleague from MCCE, Observatoire de Paris, Sorbonne Université, has found more evidence that the moon has

an inner core similar to Earth's. In their study, reported in the journal *Nature*, the group analyzed data from a wide variety of sources and used it to create models depicting the inner parts of the moon

In 2011, planetary scientists at NASA used seismic data recorded by Apollo astronauts to predict what might lie at the center of the moon. They suggested it was likely that there was a solid inner core with a radius of approximately 240 kilometers. In this new effort, the researchers used a variety of sources to make similar estimates and found evidence that matches closely with the NASA results.

To learn more about the moon's core, the research team collected data from several space missions and from several lunar-based ranging experiments. They used that data to create a likely profile for the interior of the moon, including characteristics such as deformations created due to gravitational interactions with the Earth, the moon's distance from Earth and also the moon's density. They then input all of their data into a modeling application. Next, they ran multiple modeling scenarios to see which corresponded most closely with real-world data.

The model that fit most closely to observations revealed evidence of active overturn, where denser material is pulled closer to the core over time, forcing lighter material upward. This finding helps explain how many of the elements found in volcanic regions of the moon got there.

The other main finding was that the density of the inner core matched closely with that of Earth's, suggesting it is likely made of iron. The models also showed that the inner core has a radius of approximately 258 kilometers and a density of approximately 7,822 kilograms per cubic meter. It also showed the outer core to be a fluid layer covering the inner core with a radius of 362 kilometers.

More information: Arthur Briaud et al, The lunar solid inner core and

the mantle overturn, *Nature* (2023). DOI: 10.1038/s41586-023-05935-7