

# What lies beneath the far side of the moon?

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A new technique for processing lunar radar data has allowed scientists to see what lies beneath the surface of the moon in the clearest ever detail.

In a study led by the University of Aberdeen, a team of researchers discovered multiple layers of [soil](#) that lie directly beneath an area on the

far side of the moon's surface, overturning an existing theory of a single deep [layer](#) in the same area.

The area studied was the landing site of the Chang'E-4 spacecraft mission—the first to the far side of the moon.

Analysis of radar data captured by the mission's rover, Yutu-2, had suggested the existence of a single soil layer in the moon's regolith (subsurface). However, the data did not indicate the existence of different layers of soil, which were transparent to electromagnetic waves due to the smooth boundaries between them.

By developing a new method of processing the data captured by Yutu-2, which uses the shape of radar signatures of buried rocks and boulders to infer the properties of surrounding lunar soil and detect previously unseen layers with smooth boundaries, scientists were able to detect four distinct layers of soil, stacked to a depth of 12 meters.

Dr. Iraklis Giannakis, from the University of Aberdeen's School of Geosciences, led the research in collaboration with counterparts from the University of Edinburgh, Northumbria University and Chinese University of Geosciences Wuhan. The results have been published in the journal *Geophysical Research Letters*.

Dr. Giannakis says that "the novel radar processing method that we have developed has allowed us to study the radar data from the Chang'E-4 landing site in much greater detail."

"By doing so, we have discovered that, rather than a homogenous 12 meter deep regolith whose material source was thought to be a nearby crater called Finsen, there is a more complicated structure where the first 12 meters consist of four distinct layers that were previously unseen using conventional radar processing."

Dr. Giannakis said that the development of a new method of interpreting lunar radar data is a significant development in planetary exploration.

He explains that "we are experiencing the new golden era of space exploration with numerous successful planetary missions and many more planned for the future."

"Tianwen-1 and Perseverance are two successful Mars missions that include radar in their scientific payloads, as well as the Chang'E-3, E-4, E-5 and the planned Chang'E-7 mission."

"The methodology we have developed can be used to infer the properties of the subsurface using [radar](#) and detect previously unseen layered structures within the first 10 to 20 meters of planetary soils. "

"This will be of great importance in terms of increasing our understanding of planetary soils, as we can now see what lies beneath the surface in more detail than ever before."

**More information:** Iraklis Giannakis et al, Inferring the Shallow Layered Structure at the Chang'E-4 Landing Site: A Novel Interpretation Approach Using Lunar Penetrating Radar, *Geophysical Research Letters* (2021). [DOI: 10.1029/2021GL092866](https://doi.org/10.1029/2021GL092866)

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