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Chang'e 5 samples suggest water resources exploitable on the moon

By studying lunar samples retrieved during the Chang'e 5 mission to the moon, Chinese scientists have found that lunar soil grains retain more water implanted by solar wind at the middle latitude region than previously thought.

Based on this finding, the scientists predict that there is a large amount of water resources available for utilization at the high latitude region of the moon.

Scientists had previously discovered the presence of surface water on the moon. They believed that solar wind implantation, volcanic outgassing, and asteroid and comet impacts are likely to be important sources of surface water.

But how does water reach and remain on the moon? How much water is in the lunar soil? How is the water distributed spatially? A study of the lunar soil samples returned by China's Chang'e 5 mission has shed new light on these questions.

The research team, led by scientists from the National Space Science Center and the Institute of Geology and Geophysics, both of the Chinese Academy of Sciences, published the new findings on Tuesday in the latest edition of the Journal Proceedings of the National Academy of Sciences.

Lin Yangting, a researcher at the IGG who led the study, explained that the water they refer to is not water in the usual sense, but structural water found in soil grains.

The research team selected 17 lunar soil grains and proved that the water on the surface was solely derived from solar wind.

Based on its analysis of heating experiments, the research team concluded that solar wind-originated water could be preserved in the middle and high latitude regions.

Previously, scientists were unable to use returned samples to study the influence of latitude on water content, since the samples collected by the Apollo missions of the United States and the Luna missions of the Soviet Union were all from low latitudes.

China's Chang'e 5 mission successfully retrieved 1,731 grams of lunar samples at the end of 2020. The probe landed at 43.06 degrees north latitude, higher than the latitudes of the landing sites of the Apollo and Luna missions. In addition, the crystallization age of the basalt in the Chang'e 5 landing area is about 2 billion years old, much younger than the sampling areas of the Apollo and Luna missions.

"The Chang'e 5 samples provided us with the opportunity to study the evolution of solar wind, and the implantation and migration of water on the lunar surface," said Xu Yuchen, the co-first author of the paper, from the NSSC.

"This discovery is of great significance for the future utilization of water resources on the moon. China plans to build a scientific research station in the south polar region of the moon. Our research shows that the south polar region of the moon may have more water than previously thought. And it is relatively easy to exploit and use the water contained in the lunar soil through particle size sorting and heating," said Lin.

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