

Possibility of water on the surface of the Moon

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When we see the Moon by ground-based telescopes or photos of the Moon taken by spacecraft or the Apollo astronauts, we just see very dry desert. However now we have some evidences of existence of water on the surface of the Moon by lunar explorations. It is a very interesting issue that whether water exists on the surface of the Moon or not, from the point of not only the planetary science but also the utilization of the lunar surface such as lunar-base. In this presentation, we will review the results obtained by previous lunar explorations, and show some possibilities for future explorations.

The possible existence of ice in the permanently shadowed craters at the Moon's poles has been said for long time. Chandrayaan-1, which was launched by India in 2008, observed spectral absorption by water molecule or hydroxyl group mainly in the polar region of the Moon. This indicated the existence of water on the surface of the Moon. In the mission of LCROSS (Lunar Crater Observation and Sensing Satellite) launched by NASA in 2009, the attached tank was separated and it hit the surface of the Moon. Then a debris cloud was made and the spacecraft observed it. Also water or hydroxyl group was confirmed to exist. However, there are many unknown things such as in what form the water exists or how much water exists.

Several theories are put forward to explain the origin of the water on the Moon: (1) originated from the interior of the Moon, (2) brought by asteroids or comets, (3) created by protons in the solar wind by colliding to oxygen in the regolith. Anyhow, since it is indicated that water exists on the surface or the Moon, there are some discussions for future explorations to study the water on the Moon both in Japan and in abroad. We hope such missions will be realized in the near future.

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