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## Years of research reveal traces of ice, water on moon

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Fifteen years of space investigation has led to confirmation that ice exists on the moon's surface. The Indian Space Research Program participated with NASA and the European Space Agency in verifying the presence of the ice. India's first spacecraft, the Chandrayaan-1, was launched in October of last year, carrying some of the temperature and texture-detection devices which became vital to the location of the water particulates.

One of the devices contained in the Chandrayaan-1 is NASA's Moon Mineralogy Mapper (M3). According to reports from NASA, the M3 located water molecules while flying over and analyzing the moon's surface.

The M3 is a highly specialized spectrometer which maps temperature variation both on and under the moon's surface, covering the visible and infra-red ranges of light.

Simultaneously, the M3 took 261 pictures of the moon's surface covering an eight kilometer square.

Due to its sensitive lens, the spectrometer retrieves thermal and geological interpretations of the moon's surface. This is pivotal for detecting the lower, water-induced temperatures of the moon.

Another spacecraft accompanying the Chandrayaan-1 as it flies around the moon is NASA's Lunar Reconnaissance Orbiter. Set for a one-year mission aimed at detecting hospitable places on the moon's exterior



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for future landing, the LRO concurrently maps the temperature deviations on the surface of the moon.

Reports from the LRO distinguished the presence of ice in the darkened areas of the moon. The lunar poles were specifically analyzed due to the continuous shadow in this region.

NASA's goal is to expand the presence of humans beyond Earth by establishing colonies on the Moon and docking stations for extended missions.

It is NASA's hard work dating back to the Clementine mission of 1994. Clementine flew around the moon, analyzing surface data and detecting the possible locations of ice.

Paul Spudis, a resident scientist over the 1994 Clementine launch, referred to the moon as "the most valuable piece of real estate in the solar system." Perhaps the substantiation of its presence has heightened its price in the galactic economy.

Although the profitable lunar ice has been validated, colonization will require effort. It is not readily available and must be extracted.

Large quantities of lunar soil will be utilized in order to collect rather small amounts of water in each process.

Extracting the ice clusters and hydroxyl molecules is possible, but it will be tedious.

One real possible benefit of the work will be a more suitable place to colonize. Extended space missions will also benefit since the hydroxyl molecules in the soil can be split and converted into rocket fuel.

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