

## Scientific approach for the promotion of lunar polar exploration mission

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Remote sensing spacecraft missions (e.g., LCROSS and Deep Impact), lunar sample studies, and theoretical simulations suggest the existence of various water species (e.g., H<sub>2</sub>O ice, hydroxyl and molecular water, and aqueous phase) on the lunar surface and in the subsurface. Lunar water is thought to originate from solar wind, meteorite/asteroid/comet collisions, and/or volcanic eruptions and concentrated locally on the lunar surface to subsurface, especially permanently shadowed regions near the lunar poles. These findings indicate the possibility of the presence of available water resources for future human activity on the Moon. Moreover, lunar water is significant because it is closely related to a formation process of the lunar magma ocean and its differentiation to the mantle. Therefore, Lunar Polar Exploration Mission is planned to be launched in the 2020' s to survey lunar water. From the viewpoint of resources, science and engineering, this mission provides new insights into lunar evolutionary history and lunar base construction. Here, we will discuss analytical techniques for in-situ water analyses on the lunar poles and experiments simulating low-temperature and high-vacuum lunar environment.

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