

Lunar water exploration expands human activity in space

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On October 18, 2019, the Japanese government decided to participate in the U.S.-led international space exploration (Artemis program). The Artemis program is the sum of all programs relating to manned landings on the Moon, including the Gateway, SLS, Orion, Human Lander, CLPS, and other lunar activities. NASA is aiming not only for lunar exploration but also for manned landings on Mars in the 2030s, aiming to acquire the necessary technology through sustained lunar activity. In this way, it can be said that the era of considering and implementing exploration of the Moon and Mars within the framework of international cooperation, including its political significance, is no longer in science fiction novels but is approaching us with reality.

This is a great opportunity for academia who has been involved in the related research activities. In particular, it is important to deepen the discussion on whether lunar water is really available, how it can be used, and how Japan will be involved in the Artemis program proposed by the U.S. Numerous scientific data have been reported indicating the presence of water on the lunar surface. However, the amount, existence form and depth of the water are not well understood. Under such circumstances, international space exploration activities have emphasized the importance of exploring water as a resource. However, it is clear that lunar water exploration has high scientific significance. And engineering to realize the science is expected to contribute to concept of future space observation and deep space exploration not limited to lunar exploration.

In light of these rapid changes in space exploration, let's first imagine a sustainable society built in space in order to expand human activity in space. In order to minimize the reliance on materials and energy transport from distant Earth, and to build and develop a highly-independent society in space, it is necessary to address a very wide range of issues. As part of this effort, it is essential to discuss beyond the framework of conventional national policy of space development and space activities, without being limited to the development of science and technology to enable the sustainable activities of humans in space. For example, the objectives of human activities, the establishment of economic activities, the enhancement of institutions and education, and the development of culture can be considered as issues.

The present talk will introduce the recent efforts of JAXA on international space exploration, the status of studies from a scientific and engineering perspective about Japan's participation in the Artemis program, and trends in human planetary habitation activities in Japan and overseas.

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