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JAPAN'S SCENARIO AND ROADMAP FOR INTERNATIONAL SPACE EXPLORATION

Abstract

International space exploration activities are remarkably in progress especially for lunar missions such as resuming human landing on the moon, constructing an international space station called Gateway in lunar orbit as part of the Artemis program. The Japan Aerospace Exploration Agency (JAXA) is currently managing on-going research and projects related to international space exploration, and also developing Japan's international space exploration scenario that outlines a future roadmap to explore the Moon and Mars. This paper introduces and discusses recent activities in Japan.

First, JAXA's Smart Lander for Investigating Moon (SLIM) successfully landed on the lunar surface in January 2024. Analysis of the image data captured at an altitude of around 50 meters confirmed that SLIM landed with accuracy of about 10 meters, which is far exceeding the target accuracy of 100 meters. It is expected that the pin-point landing technology will be utilized for incoming future landers. Secondly, Lunar Polar Exploration (LUPEX) mission is planned as a collaboration with ISRO to study lunar water resources and to explore suitability of a lunar polar region for an establishment of a lunar base. Also, Japan will provide habitation technologies and logistics resupply capabilities to Gateway. Furthermore, JAXA will contribute to human lunar surface missions by providing transportation vehicles, by collaborating with non-space industry such as an automotive giant, to develop the Pressurized Rover, which will dramatically expand the exploration area for crewed and uncrewed missions and increase flexibility in scientific research. At last, Japan also aims to provide a Communication, Positioning, Navigation and Timing (CPNT) capacity to support Cis-lunar space missions by participating in the LunaNet architecture.

Regarding Mars exploration, the Martian Moons eXploration (MMX) mission, led by JAXA and in collaboration with the German Aerospace Centre (DLR), the French National Centre for Space Studies (CNES), NASA, and ESA, will return samples from Mars' moon Phobos to investigate the origin of the Martian moons and the transportation of water and organic materials to planets in the solar system.

Finally, it is worth mentioning that a new scheme named as "the Space Strategy Fund" is established by the Japanese government including the space exploration area. The fund aims to accelerate and strengthen the achievements to expand the space economy, to solve global and social issues and to pioneer frontier.

In conclusion, JAXA has been contributed to international space exploration in many aspects and will endeavor further expedition for humanity.