SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

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MISSION CONCEPT OF MARTIAN MOONS EXPLORATION (MMX)

Abstract

Martian Moons eXploration (MMX) is a mission under study in ISAS/JAXA to be launched in 2020s. This paper introduces the concept of MMX mission. "How was water delivered to rocky planets and enabled the habitability of the solar system?" This is the key question to which MMX is going to answer. Solar system formation theories suggest that rocky planets must have been born dry. Delivery of water, volatiles, organic compounds etc. from outside the snow line entitles the rocky planet region to be habitable. Small bodies as comets and asteroids play the role of delivery capsules. Then, dynamics of small bodies around the snow line in the early solar system is the issue that needs to be understood. Mars was at the gateway position to witness the process, which naturally leads us to explore two Martian moons, Phobos and Deimos, to answer to the key question. The goal of MMX is to reveal the origin of

the Martian moons, and then to make a progress in our understanding of planetary system formation and of primordial material transport around the border between the inner- and the outer-part of the early solar system. On the origin of Martian moons, there are two leading hypotheses, “Captured primordial asteroid” and “Giant Impact”. We decide to collect samples from a Martian moon to conclude this discussion, and on the conclusion, to investigate further to improve our understanding of material distributions and transports at the edge of the inner part of the early solar system as well as of planetary formations. Moreover, circum-Martian environment will be measured and Martian atmosphere will be observed toimproveourviewsofevolutionsofMartianmoons as well asMarssurfaceenvironmentaltransition. In the conceptual design phase, the goals and objectives of the mission are defined, and the feasibility of the mission is evaluated. Fundamental engineering options are listed up, and trade-off studies are conducted to define baseline plan. Key technology issues are identified and their technology readiness is evaluated. The results will be shown in the paper.