

日本の火星科学探査の展開

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Scientific Mars mission in Japan

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JAXA is now discussing a new category of space exploration programs, especially for lunar and planetary exploration. Since planetary exploration takes a great deal of time, human, and budgetary resources, it is indispensable to carefully construct a programmatic strategy for the exploration with a long-term vision. Although NOZOMI, the Japanese first Mars mission, was not successful in its orbital insertion around Mars, some consider a future recovery mission based on the scientific and technical heritages of the NOZOMI mission. Mars consists of many regions including the interior, surface, atmosphere, and (induced) magnetosphere, which strongly interact and linked to each other. Hence it would be more correct to consider the Martian environment as a single system: interior-surface-atmosphere-magnetosphere system. The Martian atmosphere is continuously (or intermittently) supplied or eroded by the interactions: volcanic activities have released gases that include CO₂ and H₂O, while Sun's radiation and solar wind interaction have stripped off the greenhouse gas and water over billions of years, leading to a long-term evolution of the environment of the linked system. Moreover, the total inventory of CO₂, the main component of the Martian atmosphere, would have experienced relatively short-term (seasonal to ~0.1 Myr) exchanges between the atmosphere-polar caps-regolith reservoirs due to obliquity variations etc and caused abrupt changes in the climate state, which requires better understanding of the Martian climate system. Future Mars missions should programatically investigate the relation between the regions in the linked system. We will present scientific targets of the Martian interior-surface-atmosphere-magnetosphere system and a possible scenario to explore them.