

Future prospect and scientific objectives of the study of the Mars-solar wind interaction

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Recent observations by Mars Global Surveyor (MGS) and Mars Express (MEX) revealed that the plasma environment of Mars is more complex and more intriguing than ever thought. For example, MGS found banded magnetic field patterns at various locations of the Martian surface, while MEX identified auroral-type emissions on the nightside, which are highly correlated with the position of the highest magnetic field intensities identified by MGS. MEX also identified that heavy ions escaping from the Martian atmosphere consist of not only O⁺ and O₂⁺ but also CO₂⁺. This finding suggests that the dense (bars of) greenhouse gas that Mars had once possessed may have been stripped off via the solar wind interaction over billions of years. However, there has been no comprehensive observations of the Mars-solar wind interaction, so that the processes responsible for the atmospheric escape from Mars and their impacts on the planetary environment are not yet understood. The atmospheric escape from Mars was one of the primary objectives of NOZOMI, the Japanese first mission to Mars. It is also the primary objective of TOPS, an earth-orbiting space telescope mission proposed as the first mission of the small-satellite series of ISAS/JAXA scheduled to launch in 2012. The scientific objectives for the next Martian exploration mission should be defined based on these recent findings by MGS and MEX and the future plans of the telescope and the other Martian exploration missions. In this talk, we present scientific objectives of the Mars-solar wind interaction and possible scenario(s) to explore them.