Atmospheric Escape Science by Mars Exploration Mission MELOS: Approach from imaging observation.

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The upper atmospheric components of the terrestrial planets are ionized due to photoionization by the solar extreme ultraviolet/ultraviolet light and due to impact with the high energy plasma, and interact with a magnetic field or a plasma flow around the planets to escape from the planetary atmosphere. In the environment around the Earth, the magnetosphere is produced by the intrinsic magnetic field, and the escape components are supplied to the magnetosphere. The planet such as Mars and Venus has no strong magnetic field, and the atmospheric particles directly interact with the solar wind plasma to escape into interplanetary space. The atmospheric escape has been proven by the in-situ plasma measurements of the spacecraft around each planet. However the total escape rate estimated from the only in-situ measurements has a large ambiguity because of the limit of the observation methods. Therefore the imaging observation appropriate to the comprehension of the global plasma distribution is one of prospective methods.

In this paper, promising results from the plasma and upper atmospheric imaging are displayed for the proposed Mars explorer mission. The recent spacecraft observations are clear that the liquid water existed on the surface of the Mars. The liquid water stably exists in the warm environment which is produced by the high atmospheric pressure preserved by CO_2. However, the present Mars has a dry atmosphere with a low pressure. In order to understand the escape of CO_2 from ancient Martian atmosphere, we proposed the imaging of the global distribution such as carbon, oxygen, hydrogen, and water, and approach the circulation of the liquid water in the present Martian atmosphere.