MAVEN観測に基づく火星磁気圏尾部からの重イオン流出に関する統計的研究

乾 彰悟 [1]; 関 華奈子 [2]; 堺 正太朗 [2]; Brain David A.[3]; 原 拓也 [4]; McFadden James P.[4]; Halekas Jasper S.[5]; Mitchell David L.[4]; DiBraccio Gina[6]; Jakosky Bruce M.[7]
[1] 東大・理・地惑; [2] 東大理・地球惑星科学専攻; [3] LASP, Univ. of Colorado at Boulder, USA; [4] SSL, UC Berkeley; [5] Dept. Phys. & Astron., Univ. Iowa; [6] NASA GSFC; [7] LASP, CU Boulder

Statistical study of heavy ion outflows from Mars observed in the Martian induced magnetotail by MAVEN

Shogo Inui[1]; Kanako Seki[2]; Shotaro Sakai[2]; David A. Brain[3]; Takuya Hara[4]; James P. McFadden[4]; Jasper S. Halekas[5]; David L. Mitchell[4]; Gina DiBraccio[6]; Bruce M. Jakosky[7]
[1] Earth and Planetary Science, Univ. of Tokyo; [2] Dept. Earth & Planetary Sci., Science, Univ. Tokyo; [3] LASP, Univ. of Colorado at Boulder, USA; [4] SSL, UC Berkeley; [5] Dept. Phys. & Astron., Univ. Iowa; [6] NASA GSFC; [7] LASP, CU Boulder

Mars does not have a global intrinsic magnetic field. Therefore, planetary ion escape through interaction between the solar wind and the Martian upper atmosphere is one of the candidate mechanisms of the atmospheric escape. On the other hand, Mars has local crustal magnetic fields. Effects of these crustal magnetic fields on atmospheric escape are far from understood. In this study, we report on a statistical analysis of heavy ion outflows from Mars in order to understand influences of the local crustal magnetic fields and the direction of solar wind electric field on the ion outflows based on the MAVEN satellite observations. Data from the STATIC (ion composition), SWIA (solar wind ion), and MAG (magnetic field) instruments from Nov. 2014 to Dec. 2017 were used for the statistical study. We focused on the heavy ion outflows in the magnetotail wake region.

Based on the analysis method used in the previous study [Inui et al., GRL, 2018], we investigated properties of O+, O2+, and CO2+, separately. We divided data by the location of the strong local crustal magnetic field around east longitude of 180 degrees into 4 local time groups: noon, dawn, dusk, and night. We also divided the data by locations of the ion outflow detection: upward E and downward E hemispheres in the Mars-Solar-Electric field (MSE) coordinates and north and south hemispheres in the Mars-Solar-Orbital (MSO) coordinates. The results show that number densities of heavy ions observed in the downward E hemisphere in the MSE coordinates tend to be higher than those observed in the upward E hemisphere, while the trend of heavy ion bulk velocity is opposite. The results also show that the number fluxes of escaping heavy ions are larger in downward E hemisphere than in upward E hemisphere. However, we do not find the clear evidence that the location of the strong crustal magnetic field affects the statistical properties of the heavy ion outflows. We also report on the ratio of the three ion species in the outflows.