

Effects of different drivers on ion losses at Mars. MAVEN observations

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MAVEN. It will be shown that fluxes of planetary ions extracted at different ionospheric altitudes and escaping through different channels (the trans-terminator region, the ion plume, the tail lobes, the plasma sheet) respond differently on variations of the different drivers. Solar irradiance controls the fluxes of low-energy ions in the tail lobes. Ion losses through the plasma sheet vary with solar wind variations. As a result, total escape losses critically depend on the external conditions.

Abstract

1. Recent observations by Mars Express and MAVEN spacecraft have shown that the Martian atmosphere/ionosphere is exposed to the impact of solar wind which results in losses of atmospheric/ionospheric species from Mars. To estimate the escape forced by the solar wind during the early Solar System conditions when solar wind was stronger and the EUV flux was higher we need to know how the ionosphere of Mars and escape fluxes depend on variations in the strength of the external drivers, in particular, of solar wind and solar EUV flux. We consider the role of the following components: the solar wind flux, the solar wind dynamic pressure, the motional electric field, the geometry of the interplanetary magnetic field and the solar irradiance.

2. We present multi-instrument observations of the influence of the solar wind and solar irradiance on the Martian ionosphere and escape fluxes. The measurements made by MAVEN provide us for the first time the opportunity to study these processes with simultaneous monitoring of the solar wind and ionospheric variations, planetary ion fluxes and solar irradiance. We use data obtained by the STATIC, NGIMS, SWIA, MAG and EUV monitor on