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Variability of the martian upper ionosphere and ion escape

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Abstract

At altitudes above ~200 km, the Martian ionosphere is no longer in photo-chemical equilibrium and strongly variable and complex. We will discuss how different external and internal factors control its variability. We present the observations in the upper ionosphere of Mars carried out by Mars Express and MAVEN spacecraft demonstrating a coupling of the ionosphere with the processes above and below it. Solar EUV flux remains to be important in the upper ionosphere. With increase of the solar irradiance the ionosphere expands above the nominal position of the induced magnetosphere and becomes denser. Solar wind also affects its structure. For example, with increase of the solar wind strength the upper ionospheric layers are density depleted. The upper ionosphere is sensitive to the IMF direction. In the hemisphere, in which the motional electric field is directed toward the planet, the ionosphere is denser and expands to higher altitudes as compared to the ionosphere in the opposite hemisphere. Crustal magnetic field modifies the ionosphere structure producing a large bulge in the southern hemisphere. All these variabilities significantly affect ion losses at Mars.

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