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Bursty Escape on Mars

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Abstract

Bursty or filamentary structuring of plasma flows is a typical feature of the Martian space. This phenomenon is revealed during time periods when MEX-ASPERA-3 is operating in the high temporal resolution mode. Frequency of oscillations is about 10-50 mHz. Amplitude of flux variations reaches a factor of 10-30. Bursty origin of fluxes of oxygen ions can be the important process for solar wind induced escape on Mars. There are several mechanisms which can be responsible for the observed periodic bursts. Large-amplitude coherent pressure pulses generated by ion beams upstream the bow shock impact the magnetosphere and produce periodic pulses in forces pushing planetary plasma. Pressure pulses can arise downstream the bow shock - in the magnetosheath, which becomes to be decomposed into a sequence of periodic compressive waves. A wavy dynamics can also appear due to a multi-ion origin of the interacting plasmas since such a medium behaves as a specific rotator. At last, not at least, K-H or other types of large-scale MHD instabilities probably excited in the interface region can generate surface waves which will also modulate the tension forces. We present the different observations which can be interpreted in a favor of all the above mechanisms implying a complex and diverse plasma wave environment at Mars.