

# Efficiency of Solar wind electric field in accelerating planetary ions

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## Abstract

Ion escape of planetary ions are very important for Mars and other unmagnetized bodies. Energy from the Solar Wind transported to heavy ions such as  $O^+$  and  $O_2^+$  ions caused a loss of planetary water. But the effective energy transfer efficiency of this process has never being estimated before Mars Atmosphere and Volatile Evolution (MAVEN) mission. Based on four years' MAVEN data, the statistical electric field experienced by accelerated  $O^+$  and  $O_2^+$  ions were calculated and compared with solar wind  $-\mathbf{V} \times \mathbf{B}$  electric field. Results show a strong correlation between these two electric fields, indicate a permeate of solar wind electric field into Martian magnetosphere. This is the first time show a total electric field experienced by heavy planetary ions, provide a chance to evaluate the transferred energy efficiency of different possible processes. Perhaps the solar wind  $-\mathbf{V} \times \mathbf{B}$  electric field is the most effective force to accelerate heavy ions to keV energies.