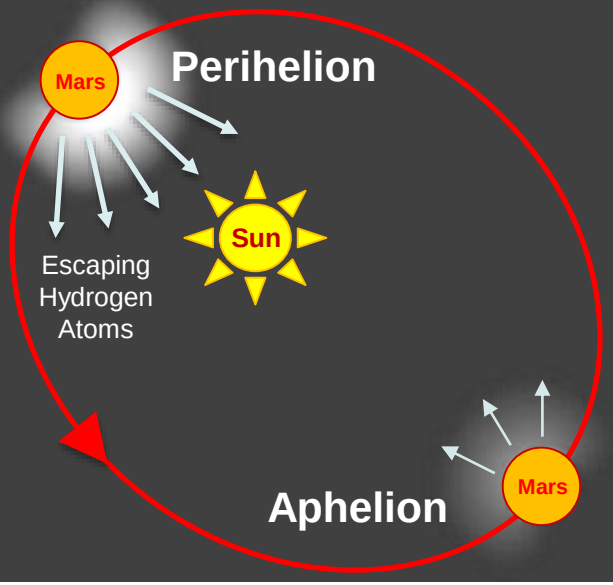
MAVEN Detects Steep Drop in Hydrogen Escape at Mars

Understanding the escape rate of hydrogen is critical to understanding how Mars evolved from a wet planet to its current desert conditions. MAVEN has detected an unexpectedly precipitous drop in the hydrogen escape rate from Mars over the course of a Mars year. Independent observations from four MAVEN instruments show a factor of 10 decrease in the abundance of hydrogen in the corona, corresponding to a similar decrease in the neutral H escape rate. Though a decline in coronal density was expected as Mars goes from perihelion to aphelion, the MAVEN team is working to explain why the decrease is so much more than the predicted factor of two.



(1) Scattered Solar Radiation

The Imaging Ultraviolet Spectrograph (IUVS) on MAVEN has measured a drop in the amount of solar radiation scattered by hydrogen atoms in the corona [1]

Interplanetary Magnetic Field

Bow Shock

H Corona

MAVEN's orbit

MAVEN

Solar Wind Protons (H^+)

Neutral H

Mars

(2) Precipitating H atoms

Solar Wind Ion Analyzer (SWIA) measurements show that the amount of energetic hydrogen produced by solar wind charge exchange with the hydrogen corona precipitating into the Martian atmosphere has diminished [2]

(3) H^+ Ions

The Suprathermal and Thermal Ion Composition (STATIC) instrument and SWIA have observed a reduction in the fluxes of ionized planetary hydrogen, called "pickup ions" [3]

(4) Electromagnetic Waves

The magnetometer (MAG) on MAVEN has measured a decrease in the occurrence of waves excited by hydrogen pickup ions [4]

(1) Clarke et al. (2) Halekas et al. (3) Rahmati et al. (4) Romanelli et al. (JGR MAVEN Special Issue, 2016)