Hydrogen Escape from Mars: A Template for Exoplanet Escape

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Hydrogen escape from Mars is seasonally variable by more than a factor of ten, and has been responsible for removing a large fraction of Mars' initial water inventory over Solar System history. At present, it seems that H loss is mostly driven by slow and steady diffusion of H_2 photochemically produced in the lower atmosphere, with seasonal bursts resulting from high-altitude water producing H that can promptly escape. While loss today appears mostly thermal, driven by collisions in the thermosphere, there are some hints that ion chemistry may produce a hot component that could further enhance escape, producing loss similar to that seen at Venus. In addition, questions remain about the nature of H escape under an early Martian dynamo, where polar wind-type outflow may have also contributed to loss. The diverse nature of H loss processes exhibited at Mars today and in the past make the planet an ideal laboratory for understanding the controls on terrestrial planet dessication in general, providing lessons for understanding exoplanetary H loss and interpreting exoplanet observations. I will present an overview of the current understanding of Martian H loss as observed by the Mars Atmosphere and Volatile EvolutioN mission's Imaging Ultraviolet Spectrograph (MAVEN/IUVS), and interpret this loss in its Solar System and exoplanetary context.