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# Ion escape from the early Martian atmosphere

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The evolution of the Martian atmosphere inventory is influenced by thermal and non-thermal atmospheric loss into space, as well as by chemical weathering to the surface. In order to study how much of the ionized part of the upper atmosphere of Mars could have been lost to space over the planet's history and discuss the effect of the total atmospheric loss on the evolution of the climate and hydrosphere of Mars, we apply global 3-D magnetohydrodynamic (MHD) and test particle simulation models of the solar wind interaction with the upper atmosphere of Mars. For reconstructing the past solar radiation and solar wind environment we use data from the observation of solar proxies with different ages. For modeling thermosphere over the Martian history we apply a diffusive-gravitational equilibrium and thermal balance model which investigate the heating of the thermosphere by photodissociation and ionization processes, due to exothermic chemical reactions and cooling by CO2 IR emission in the 15 ČÊm band. We present simulation results of the solar wind interaction with the XUV-heated, highly expanded upper atmosphere of early Mars and show estimate of non-thermal ion escape rate from the early Martian atmosphere.