



Atmospheric erosion at young Mars

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Martian atmosphere has had many different phases during the history of planet. Atmosphere of the Mars when the planet was young has a special interest because the planet's atmosphere has been argued to have been then much denser than today. However, how and when Martian atmosphere changed to the present time tenuous and dry atmosphere is one of the fundamental science questions in Mars science.

We have studied how young Mars lost its atmospheric and exospheric oxygen and carbon into the solar wind when ionized atmospheric oxygen and carbon atoms are picked up by the solar wind convection electric field. Analysis was made by a 3D kinetic hybrid model which treats ions as particles and electrons as a massless charge neutralizing fluid. The hybrid simulation allows to study self-consistently the motion of ions in the Martian magnetosphere and to estimate the total ion escape rate.

In the paper we represent results of the hybrid model simulations made for different epochs of young Martian atmosphere, where different neutral number density profiles of oxygen and carbon as well as different solar wind parameters were used. These various conditions correspond solar activity during different Martian epochs and different levels of the solar photoionization EUV rates. Especially, we investigate the dependence of the oxygen and carbon ions escape to different EUV levels which Mars had in the past.