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Can magnetizing Mars increase the atmospheric escape?

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Recent findings of Mars Express indicate that the current atmospheric escape due to the solar wind interaction isas low as 3.9^{23} particles/s ($O^+ + O_2^+ + CO_2^+$) (*Barabash et al., 2007*). This escape, even if increased on a factor of 5 corresponding to the maximum solar conditions (*Ma et al., 2004*), can not be responsible for the removal of the substencial amount of water and carbon dioxide over the last 3.5 Gy. Therefore, if the "warm and wet Mars in the past" hypothesis is still assumed to be valid, one has to investigate other escape channels. Currently Mars does not have the global magnetic field because the dynamo ceased to operate 4 - 4.5 Gy ago. We thus investigated the question weather or not weak Martian dipole field inthe past could affect the atmospheric escape induced by the solar wind. The presence of a weak dipole field affects the solar wind interaction twofold. On one hand, a small magntetosphere is created (somewhat similar to the Mercury one). It shields the upper atmosphere from the direct interaction with the solar wind decreasing the escape rate. On the other hand, open field lines in the cusp region increase the escape. The net balance depends on the magnetic field intensity. The initial simulations performed with the 3-D quasi-neutral hybrid model (*Kallio and Janhunen, 2002*), which includes the escape rate as a free parameter and a weak dipole at the center of Mars, show that at the dipole strength corresponding to 100 nT field at the surface of Mars, the O^+ ion escape can be increased on a factor of 2. Further increase of the dipole strength results in decreasing of the escape rate. The simulations have been performed at the current solar wind conditions. The first results indicate that there is a trend of increasing the escape rate although not to the extent it becomes evolutionary significant.