Solar wind conditions on the escape of oxygen from Mars

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The Martian atmosphere was warm and high pressure several billions of years ago[Carr, 1999]. The Martian atmosphere is dry and low pressure (636 Pa)[McKay and Stoker, 1989; Kerr, 2000; Baker, 2001]. Although about 95% of Martian atmosphere is CO2, about 90% of escaping atmosphere is oxygen (O, O+) from the observation by Mars Express[Lundin et al., 2009].Oxygen escape may be important for the evolution of the water of Mars. Mars does not have a significant internal magnetic field. The solar wind can penetrate to the Martian ionosphere altitude and interact with the Martian ionosphere [Acunã et al., 1998; Lundin et al., 2004]. Then, ionopause and bow shock are formed, and oxygen ion escape is strongly affected by the solar wind. The structures of ionopause and bow shock are important for oxygen ion escape.The important escape mechanisms of Martian atmosphere are Dissociative Recombination, Solar Wind pick up and Sputtering. The previous models do not include the effect of the collision of the escaping particles with the atmospheric particles and the escape of the collided secondary particles. Then, We constructed a model including dissociative recombination, solar wind pick up and spattering processes, and investigated the amount of the atmospheric escape from Mars.We calculated the solar wind interaction with the Mars ionosphere with Magnetohydrodynamics equations and particle model of Oxygen, and we found that the solar wind conditions around Mars control the escape flux of Oxygen in Mars.

Keywords: Mars, Solar wind, Escape, Oxygen

