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Three dimensional Mars' exosphere : multi-species thermal and nonthermal models

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The escaping rate of Mars' atmosphere is an important issue for its evolution. However, to know the atmospheric escape, it is crucial to well describe Mars' upper atmosphere and exosphere. In this presentation, a three dimensional exospheric model of the main constituents of Mars' thermosphere will be presented. This model describes the Martian exosphere as composed of thermal and non-thermal components. The thermal components of the O and CO_2 exospheres are computed from a modified Chamberlain approach which is extended to three dimension including planetary rotation. A Monte Carlo test particle scheme is used to simulate the nonthermal O exosphere produced by dissociative recombination (DR) of O2+ in the thermosphere. The thermospheric and ionospheric conditions are calculated by Mars Global Circulation Model (Gonzalez-Galindo et al., Journal of Geophysical Research, 114, 2009). In this presentation, we will present the main results of this work (Yagi et al., Icarus, Submitted, 2012), that is, the seasonal variations of Mars' exosphere and of the atmospheric escape. This work is part of a project named HELIOSARES aiming to describe Mars' interaction with the solar wind by coupling different numerical models.

Keywords: Mars, Exosphere, Atmospheric Escaping, Simulation