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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, before knowing 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 two components of non-collisional atmosphere with thermal components and non-thermal components. The thermal components of O and CO_2 are computed by a modified Chamberlain approach which is extended to three dimensional including planetary rotation. Monte Carlo test particle scheme is used to simulate nonthermal components of O and C which are produced by dissociative recombination (DR) of O_2^+ and CO^+, by exothermic photo-chemical reactions and by picked up ion sputtering. The thermospheric and ionospheric conditions are calculated by Mars Global Circulation Model. In this presentation, we will present the main results of this work, that is, the signatures of the Mars' exosphere and the atmospheric escape of each species. This work is part of a project named HELIOSARES aiming to describe Mars' interaction with the solar wind.