



Martian Atmospheric Sputtering

Giovanna Rinaldi, Alessandro Mura, Stefano Orsini, and Valeria Mangano
INAF, ifsi, roma, Italy (giovanna.rinaldi@ifsi-roma.inaf.it)

The main topic of our work is the study of the Martian atmospheric sputtering. Atmospheric sputtering is a process occurring when a energetic particle impinges on atmospheric particles and the atoms, located in the upper regions of the atmosphere, must overcome the gravitational attraction of the planet. During the process, the energy can be transferred by either elastic or inelastic collisions

To study this process we develop a Montecarlo single-particle model that simulates the cascade process producing sputtering emission. In our model we include energy-dependent differential cross section for i) elastic collision, ii) ionization; iii) electron-loss; iv) charge exchange. These cross section values are derived by an accurate review of the current literature

In the present study, we also show the comparison between our result and existing theoretical models and observations. The data are taken by the NPD instrument, part of the Analyzer of Space Plasma and Energetic Atoms (ASPERA-3) on board Mars Express. After calibrating the model with NPD data, the simulation results show a remarkable contribution of atmospheric sputtering ($\sim 10^{23}$ atom/s) to the planetary atmospheric loss in agreement with the estimations of previous works. The comparison between the observed flux and simulations shows us that the intensities are very similar (flux is around 10^5 cm⁻²/sr/s).