

A technique of retrieving the exospheric number density distribution from pickup ion ring distributions observed by MAVEN/STATIC and its application to future MMX/MSA observations

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Ion pickup by the solar wind is ubiquitous in space plasma, generating pickup ions. Because pickup ions are originally produced by ionization of the exospheric neutral atmosphere, their measurements contain information on the exospheric neutral abundance. Here we establish a method to retrieve exospheric number densities, by analyzing ion velocity distribution functions of pickup ions measured by the Mars Atmosphere and Volatile Evolution spacecraft. We retrieved exospheric oxygen density distribution between altitudes of ~1,000 km and 10,000 km around Mars. The consistency between the retrieved oxygen density distribution the modeled density distribution of the Exospheric General Model suggests that the oxygen atoms are mainly produced by dissociative recombination of O_2^+ in the Martian ionosphere. This method may be applied to other space missions to study the upper atmosphere of planets, moons, and small bodies in the solar system, where pickup ions exist. In this presentation, we discuss the application of this method to our future observations of the Mass Spectrum Analyzer on the Martian Moons eXploration spacecraft.

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