Density, Energy and Phase Space Density Distribution of Planetary Ions He+, O+ and Na+ in Mercury's Magnetosphere

Elisabeth Werner, François Leblanc, Jean-Yves Chaufray, Ronan Modolo, Sae Aizawa, Jim M. Raines, Willi Exner, Uwe Motschmann

▶ **To cite this version:**

Elisabeth Werner, François Leblanc, Jean-Yves Chaufray, Ronan Modolo, Sae Aizawa, et al.. Density, Energy and Phase Space Density Distribution of Planetary Ions He+, O+ and Na+ in Mercury's Magnetosphere. EGU General Assembly 2021, Apr 2021, Online Meeting, France. 10.5194/egusphere-egu21-1191 . hal-03216420

HAL Id: hal-03216420

https://hal.sorbonne-universite.fr/hal-03216420

Submitted on 4 May 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

EGU21-1191
https://doi.org/10.5194/egusphere-egu21-1191
EGU General Assembly 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Density, Energy and Phase Space Density Distribution of Planetary Ions He+, O+ and Na+ in Mercury's Magnetosphere

A. L. Elisabeth Werner[1], François Leblanc[1], Jean-Yves Chaufray[2], Ronan Modolo[2], Sae Aizawa[3], Jim M. Raines[4], Willi Exner[5,6], and Uwe Motschmann[6,7]

[1]LATMOS/IPSL, CNRS, Sorbonne Université, UVSQ, Paris, France (elisabeth.werner@latmos.ipsl.fr)
[2]LATMOS/IPSL, UVSQ Université Paris-Saclay, Sorbonne Université, Guyancourt, France
[3]IRAP, Toulouse, France
[4]Department of Climate and Space Sciences and Engineering, University of Michigan, Ann Arbor, MI USA
[5]Institute for Geophysics and extraterrestrial Physics, TU Braunschweig, Braunschweig, Germany
[6]Institute for Theoretical Physics, TU Braunschweig, Braunschweig, Germany
[7]DLR Institute of Planetary Research, Berlin, Germany

The Mercury plasma environment is enriched in planetary ions from the tenuous neutral exosphere. We have developed a test-particle model which describes the full equation of motion for planetary ions produced from photo-ionization of the neutral exosphere. The new test-particle model is coupled to a Monte Carlo test-particle model of the neutral exosphere (Exospheric Global Model; EGM; Leblanc et al. 2017) and two hybrid-kinetic models: LatHyS (Modolo et al. 2016) and AIKEF (Müller et al. 2011). This coupling will allow us to consider the impact of non-adiabatic energization on the ion density distribution as well as the connection to seasonal asymmetries in the neutral exosphere.

We compare the density, energy and phase space density distribution of He+, O+ and Na+ from our model with observations from the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) time-of-flight spectrometer Fast Imaging Plasma Spectrometer (FIPS; Raines et al. 2013). Our results indicate the presence of several interesting high-density structures both inside and outside FIPS observable energy range (E = 0.05 -13 keV), the properties of which are likely very sensitive to the upstream solar wind conditions. We present how these results may aid the interpretation of FIPS data and future measurements by BepiColombo.