



Global hybrid modeling of Mercury's space weather and BepiColombo observations

R. Jarvinen^(1,2), and E. Kallio*⁽²⁾

(1) Finnish Meteorological Institute, Helsinki, Finland; e-mail: rikku.jarvinen@fmi.fi

(2) Department of Electronics and Nanoengineering, School of Electrical Engineering, Aalto University, Espoo, Finland; e-mail: esa.kallio@aalto.fi

We study the interaction of solar wind with Mercury's magnetosphere and plasma environment with global numerical 3D hybrid plasma simulations. Ions are modeled as particles moving under the Lorentz force and electrons form a charge-neutralizing, inertialess fluid. The evolution of magnetic field is self-consistently coupled with ion dynamics via Maxwell's equations in non-radiative limit. We concentrate on the formation of plasma waves, field line resonances and accelerated ion populations in the Hermean plasma environment. Further, we analyze plasma regions and ion populations near Mercury along BepiColombo flyby trajectories prior to the orbit insertion in light of upcoming orbit phase observation of charged particles and electromagnetic fields.

1. Jarvinen R., Alho M., Kallio E., Pulkkinen T.I., 2020, "Ultra-low frequency waves in the ion foreshock of Mercury: A global hybrid modeling study", *Mon. Notices Royal Astron. Soc.*, **491**, 3, 4147-4161, doi:10.1093/mnras/stz3257.

2. Kallio E., Jarvinen R., Massetti S., Alberti T., Milillo A., Orsini S., De Angelis E., Laky G., Slavin J., Raines J.M., Pulkkinen T.I., 2022, "Ultra-low frequency waves in the Hermean magnetosphere: On the role of the morphology of the magnetic field and the foreshock," *Geophys. Res. Lett.*, **49**, 24, doi:10.1029/2022GL101850