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BepiColombo 2nd Mercury flyby: ion composition measurements from the Mass Spectrum Analyzer

On June 23rd 2022, BepiColombo performed its second gravity assist maneuver (MFB2) at Mercury. Just like the first encounter which took place on October 1 2021, the spacecraft approached the planet from dusk-nightside to dawn-dayside to an extremely close distance within about 200 km altitude above the planet's surface. This distance is closer than the two orbiters of BepiColombo will orbit the planet after the orbit insertion in 2025. Eventhough BepiColombo is in a so-called "stacked configuration" during cruise, meaning that the instruments cannot yet be fully operated, the instruments can still make interesting observations. Particularly, despite their limited field-of-view, the particle sensors will allow us to get a hint on the ion composition and the dynamics very close to the planet.

In this study, we will present the first observations of the Mass Spectrum Analyzer (MSA) at Mercury during MFB2. MSA is part of the low energy sensors of the Mercury Plasma Particle Experiment (MPPE, PI: Y. Saito), which is a comprehensive instrument package for plasma, high-energy particle and energetic neutral atom measurements (Saito et al. 2021), onboard the Mercury Magnetospheric Orbiter (Mio). MSA is a time-of-flight spectrometer that provides information on the plasma composition and the three-dimensional ion distribution functions up to a somewhat larger energy ~ 38 keV/q and masses from ~ 1 -60 amu (Delcourt et al. 2016). We will focus on the ion composition during 1) the closest approach which occurred around 09:44 UT and on the outbound orbit in the 2) foreshock region between $\sim 10:00$ UT and $\sim 10:30$ UT.

Affiliation de l'auteur principal

Laboratoire de Physique des Plasmas - CNRS

Auteur principal: HADID, Lina (Laboratoire de Physique des Plasmas (LPP) - CNRS)

Co-auteurs: DELCOURT, Dominique (lpc2e); TEAM, MSA

Orateur: HADID, Lina (Laboratoire de Physique des Plasmas (LPP) - CNRS)

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