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Overview of plasma, energetic particles, and magnetic fields in Mercury's magnetosphere: First results from MESSENGER

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Our present knowledge of Mercury's magnetosphere is derived from two Mariner 10 flybys in 1974–1975 that established the presence of an intrinsic magnetic field and of some energetic and plasma electrons. Because of the small planetary moment and the fact that the Mariner 10 flybys occurred at the same planetary rotation phase, the intrinsic and external fields have not been clearly resolved. Moreover, the fluxes and identity of energetic ions have been subjects of extensive discussion and diverse interpretations. Questions remain open concerning whether ions are present at any energy in Mercury's small magnetosphere, and what energies the electrons actually span. Launched on August 3, 2004, MESSENGER will execute the first of three flybys of Mercury on January 14, 2008. The Magnetometer will acquire data at 20 vector samples/s spanning 12 hours centered on closest approach (CA) at about 200 km altitude, providing high-resolution (0.047 nT) observations of the field magnetospheric boundaries (bow shock and magnetopause) and electromagnetic waves having frequencies up to 10 Hz. The Energetic Particle and Plasma Spectrometer (EPPS) instrument con-

sists of two sensors: The Fast Imaging Plasma Spectrometer (FIPS) measures ions from $<$50 eV/e to 14 keV/e with a time resolution of up to 8 s. During a measurement interval, FIPS detects individual ions within the mass range 1-40 amu that enter its 1.4-π-sr field of view. The Energetic Particle Spectrometer (EPS) will provide spatial and angular distributions and spectra of energetic particles (if present) from $\sim$ 15 keV/nucleon to $\sim$ 3 MeV for ions and from $\sim$ 15 keV to $\sim$ 1 MeV for electrons. It is expected that the boundaries and extent of a particle population present in the vicinity of Mercury will be firmly established, the intrinsic and external components of the magnetic field will be more fully resolved, and possible confinement of energetic particles within the magnetosphere will be delineated.