Juno’s Exploration of Jupiter’s Magnetic Field and Magnetosphere

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The Juno spacecraft was inserted into polar orbit about Jupiter on July 4\(^{th}\), 2016, performing close passes (to ~1.05 Rj radial distance at perijove) every 53 days. By the end of its prime mission, Juno will have circled the planet 34 times, uniformly sampling longitudes separated by less than 11\(^{th}\) at the equator. The Juno magnetic field investigation is equipped with two magnetometer sensor suites, located at 10 and 12 m from the spacecraft body at the end of one of Juno’s three solar arrays. Each contains a vector fluxgate magnetometer (FGM) sensor and a pair of co-located non-magnetic star tracker camera heads that provide accurate attitude determination for the FGM sensors. A more detailed view of Jupiter’s planetary dynamo is emerging as Juno acquires more perijove passes, providing spatial resolution beyond that already evident in the preliminary model (JRM09, a degree 10 spherical harmonic) derived from Juno’s first 9 perijoves. A complex and very non-dipolar magnetic field dominates the northern hemisphere, while a mostly dipolar magnetic field is observed south of the equator, where the enigmatic “Great Blue Spot” resides within an equatorial band of opposite polarity. The Jovian magnetodisc, formed by a washer-shaped disc of azimuthal (“ring”) currents, stretches magnetic field lines outward along the magnetic equator. With 26 equally spaced longitudes now available we can begin to address magnetodisc variability, finding a more or less stable system of azimuthal ring currents (few % variability) and a more variable (~50%) system of radial currents that supply torque to outflowing plasma. A new magnetodisc model greatly improves knowledge of the field geometry, independently verified via observations of the particle absorption signatures of Galilean satellites. A more systematic mapping of Birkeland currents above the polar aurorae also emerges from multiple passes. These and other developments will be presented with Juno now about ¾ of the way towards completion of its primary mission.