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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 4th, 2016, performing close passes (to ~1.05 R_J 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° 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.