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Abstract

The Juno spacecraft, in polar orbit about Jupiter since July 4, 2016, is mapping Jupiter’s magnetic field and exploring the polar magnetosphere. Juno’s 53.5-day orbit trajectory carries her science instruments to within ~1.05 $R_j$of the center of the planet (one R_j= 71,492 km, Jupiter’s equatorial radius) at periapsis and beyond 100 Rj at apoapsis. At the mid-point of Juno’s 33-orbit mapping mission, Juno has traversed the magnetosphere 23 times at local times from midnight to dawn, crossing the Jovian magnetodisc ever closer to the planet as the orbit evolves (line of apsides rotates by ~1 deg latitude every periapsis). It is now possible to more effectively separate internal and external fields near the planet with the introduction of a more accurate internal field model (JRM09). We remove the internal field and fit the residuals to the magnetodisc model of Connerney, Acuna, and Ness (1981), modified by the addition of a radial current supplying torque to outflowing plasma. This model, optimized for the Juno era, affords a great improvement in predicting satellite interaction features and also yields a measure of the time variability of the azimuthal current system (magnetodisc currents) as well as the radial current system. The former varies only slightly thus far during Juno’s mission (~6%), but the latter evidences significant variation from orbit to orbit (~50%). This model is primarily intended to improve mapping within the range of the Galilean satellites where the assumption of magnetodisc axisymmetry may reasonably prevail. We present an overview of these observations obtained during Juno’s first two years in orbit in context with prior observations and those acquired by Juno’s other science instruments.

Plain Language Summary

we model the jovian magneto disc to improve mapping of particle trajectories within the region of the magnetosphere traversed by the Galilean satellites.

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