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Poster
Exploration of Plasma Interactions and Circulation (EPIC) is a Heliophysics imaging mission to reveal the life cycle of core magnetospheric plasma. Core plasma is a fundamental magnetospheric population comprising the majority of the magnetosphere's mass, 100 to 1,000 metric tons. Core plasma is initially cold (<10 eV) within the plasmasphere and oxygen torus. During storms it is transported throughout geospace and heated to 100 eV – keV energies. EPIC is the first mission to target the critical core plasma life cycle (CPLC), by imaging four fundamental geospace populations: plasmasphere, dense oxygen torus, neutral hydrogen exosphere, and ring current. Continuous, multi-species, multi-region imaging from EPIC's high (>70º) inclination 20 RE circular orbit achieves a coordinated system-level view of the CPLC, including imaging of core plasma circulated to both dayside and nightside outer magnetosphere. This continuous, multi-region imaging is also extremely well suited to space weather monitoring/backcasting that can greatly improve predictive models. Continuous 30.4 nm EUVHe plasmaspheric He+ imaging provides a global monitor of the cold plasma, a population with several big space weather effects: (1) it controls the waves that can increase or decrease the outer radiation belt, (2) it reduces spacecraft charging, and (3) it enables estimation of inner magnetospheric convection. The first-ever 83.4 nm EUVO oxygen ion imaging will finally observe the formation and global distribution of the dense oxygen torus whose mass loading controls the Alfven speed that is fundamental to magnetosphere-ionosphere coupling, and reconnection. A high-resolution (200 km) geocoronal imager (GCI) captures the neutral H exosphere that affects atmospheric escape. Low-energy neutral atom (LENA) imaging captures the macroscale dynamics of ENA spectra to measure how core ion recirculation feeds storms. Core plasma is an essential and central component of geospace weather. EPIC improves prediction of extreme conditions driven by the many CPLC-affected plasmas and phenomena throughout geospace.
EPIC's science and space weather impacts are cross disciplinary (both "Ionosphere and Thermosphere" and "Geospace/Magnetosphere" categories), targeting a plasma population whose origin is ionospheric, whose home is the inner magnetosphere, and whose fate is to be circulated to the outer magnetosphere, both dayside and nightside.

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