Title: Earth's *Ring Current Morphology —A Merging of Theory with Observations*
Cluster: *Cross-Theme Theory and Data Analysis/SECTP*
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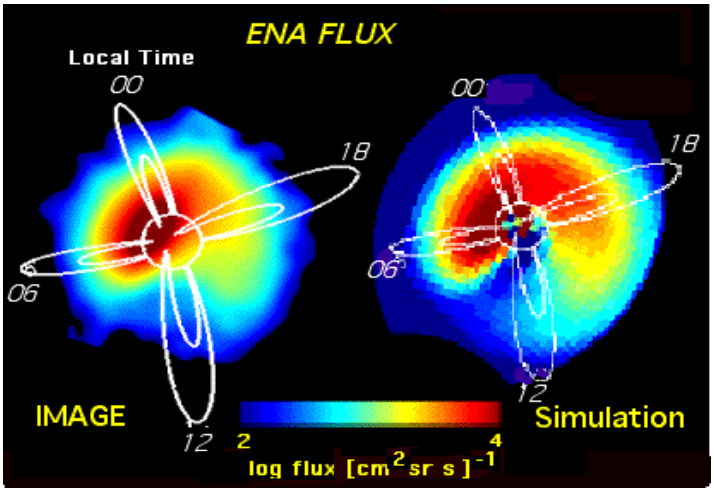
• Explanation of the asymmetry of the terrestrial ring current?

Conventional wisdom in magnetospheric research, based on simple convection electric field models and ground based magnetograms, for a long time has held that the Earth's magnetic storm, main-phase ring current is a maximum near local *dusk*. Until recently, measurements of the ring current asymmetry have not been readily available due to the absence of two well-instrumented spacecraft positioned simultaneously in the ring current at different local times. This has now changed with IMAGE remote Energetic Neutral Analyzer (ENA) observations of the ion flux distributions. Interestingly, the IMAGE observations show that the main phase ring current ion flux typically peaks in the *midnight-dawn sector*. This is in disagreement with what was expected. However, recent theoretical model calculations, using the Comprehensive Ring Current Model (CRCM), which has evolved through support by the Sun-Earth Connections Theory Program, are in remarkably good agreement with the IMAGE data. It is deduced from the model that the asymmetry occurs because the electric field pattern in the inner magnetosphere is twisted eastward relative to that in the outer magnetosphere. From the observations there are other unexplained features in the precise location of the asymmetry that ongoing CRCM developments are attempting to explain.

This represents a notable enhancement in our understanding of, and ability to predict, how solar induced magnetic disturbances affect the near-Earth environment of man. This is an excellent example of how long-term theoretical modeling efforts supported by the SECTP provide the basic frameworks needed to plan the study of, and to understand, the observations from spacecraft missions.



Main phase storm simulation of energetic neutral atom fluxes (the result of energetic protons) produces the most intense signatures in the midnight-to-dawn quadrant, agreeing with IMAGE observation.

Reference: M.-C. Fok, T. E. Moore, G. R. Wilson, J. D. Perez, X. X. Zhang, P. C. Brandt, D. G. Mitchell, E. C. Roelof, J.-M. Jahn, C. J. Pollock, and R. A. Wolf, **Global ENA IMAGE Simulations**, submitted to Space Science Reviews, 2002.