

Project Details

ROSES ID: NRA-01-OSS-01

Selection Year: 2002

Program Element: Independent Investigation: Geospace LWS

Project Title:

Temporal and Spatial Development of the Ring Current: Model Improvements and Validation Analysis

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Summary:

Geomagnetic storms are one of the most important phenomena with potential space weather consequences for human systems deployed in space and on the ground. The primary feature of geomagnetic storms is the growth of the ring current around the Earth. It is now widely recognized that the ring current development is asymmetric, with greatest intensity in the night side and dusk local time sectors. In general, the ring current does not become symmetric until late in the recovery phase. Thus, it is important to take into account both the temporal and spatial development characteristics of the ring current in models and analysis of the ring current. We propose to do this using a chain of over 20 mid-latitude ground magnetic stations to create maps of the temporal and spatial development of the storm time magnetic disturbance field. These will be compared directly with the magnetic disturbance produced by the Michigan RAM model of the ring current obtained using a Biot Savart integration. Major improvements to the model are proposed, which will include using a realistic electric field for the inner magnetosphere plasma transport in the RAM model obtained from data inversion techniques (AMIE inversion of high latitude ground magnetic data). In addition, the closure of the partial ring current via field-aligned currents will be investigated. The model, which is driven by upstream solar wind measurements and geostationary orbit plasma measurements, will be utilized to research the geoeffectiveness of solar wind drivers and the processes that affect the build-up and decay of the ring current. Validation of the global model will be through comparison with the ground-based magnetic disturbance maps and satellite (in situ and IMAGE) measurements.

Publication References:

Summary: "

Reference: Ring Current Modeling and Validation - Clauer, C. Robert U MI