

Project Details

ROSES ID: NRA-02-OSS-01

Selection Year: 2003

Program Element: Independent Investigation: LWS

Project Title:

Structure and Dynamics of the Near-Earth Large Scale Electric Field During Major Geomagnetic Storms

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Summary:

The main objective of this study is to provide the first measurements of large-scale electric fields at all local times in the inner magnetosphere during the main and recovery phases of geomagnetic storms. In addition, this study will discover the ways in which variations in solar wind driving impact the inner-magnetospheric convection pattern and electric field. This study will compare the electric field measurements to measurements of the ring current and plasma sheet populations in order to understand the processes by which the particles are energized and by which they modify the electric fields. The last main objective is to discover the systematic variations in inner-magnetospheric electric fields with increasing solar wind driving by creating average electric field vector maps covering all local times under various geomagnetic activity conditions. We propose to analyze data from the electric field instruments on the Polar and CRRES spacecraft. We will produce radial profiles of the vector electric field at all local times during the main and recovery phases of major storms, calculate potential drops associated with these electric fields, and infer convection patterns. We will compare these radial profiles to standard models. We will also compare these radial electric field profiles to simultaneous solar wind measurements obtained from the ACE and Wind key parameter data. In addition, we will make direct comparisons between the radial profile of the electric fields and the particles in the plasma sheet and ring current, as measured by instruments on Polar. Finally, we will produce average electric field maps in the equatorial plane under varying solar wind conditions, to put the storm-time measurements in context and to look for any systematic development of the electric field with increasing activity. This work is of direct relevance to the Living With a Star Science Advisory Team "Dynamics of the Near-Earth Radiation Environment" Problem Area. An objective associated with this problem area is to "Discover the processes that accelerate, transport, and distribute energetic particles during geomagnetic storms". This proposal will analyze the significance of one of these processes, the large-scale slowly-varying electric field. By providing a deeper understanding of the electric field and its effect on ring current particles we will be advancing the predictive ability of current and future models.

Publication References:

Summary: "

Reference: Wygant, John U MN - Structure and Dynamics of the Near-Earth Large Scale Electric Field During Major Geomagnetic Storms