Project Details

ROSES ID: NNH06ZDA001N
Selection Year: 2007
Program Element: Independent Investigation

Topic: Investigate the Global Distribution, Sources and Effects of Large Electron Density Gradients at Middle and Low Latitudes

Project Title:
Relativistic electron dynamics during geomagnetic storms: energization, loss and global coherence

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Summary:
The aim of our proposed research is to understand the physics of acceleration,

transport and loss of electrons in the Earth's outer radiation belt during

geomagnetic storms. Specifically we propose to (i) quantify electron flux

dynamics during geomagnetic storms over an entire solar cycle across all L

shells, (ii) characterize global coherence emphasizing pitch-angle scattering

leading to flux isotropization, and (iii) investigate the systematics of

electron decay time-scales and the specific role of electron microbursts as a

loss mechanism.

The results of our investigations will help determine the relative strengths of

particle transport versus in-situ processes in electron energization. We will

quantify the role of flux isotropization, i.e, pitch-angle scaterring during

electron acceleration. Our results of electron decay times will help distinguish

between various mechansism of pitch angle scattering leading to electron loss.

We will also quantify the extent to which microbursts result in the depeletion of electron flux.

Our research will utilize observations made by multiple spacecraft including

SAMPEX, Polar and HEO which provide a comprehensive coverage of the Earth's

outer radiation belt. Our database covers an entire solar cycle and comprises

measurements of electrons over a wide energy range. These spacecraft are in

distinct orbits around the Earth and therefore provide a global picture of the outer zone.

Our proposed research directly addresses two major objectives of the LWS program:(a) to identify and understand response of the space environment to solar variability, and (b) to quantitatively connect this response to solar variability. A major objective of the TR\&T program is to understand the acceleration, transport and loss of radiation belt particles. Space environmental conditions affecting robotic and human exploration include the Earth's Radiation belts. Our proposed research is therefore highly relevant to the LWS and especially the TR\&T program.

Publication References:

no references