

Project Details

ROSES ID: NRA-03-OSS-01

Selection Year: 2004

Program Element: Independent Investigation: LWS

Project Title:

Physical Processes Responsible for Relativistic Electron Variability in the Outer Radiation Zone over the Solar Cycle

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Project Member(s):

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- Horne, Richard Bertram; Collaborator; British Antarctic Survey

Summary:

Our basic understanding of the physical processes responsible for the variability of relativistic electrons in response to solar activity is currently incomplete. These extremely energetic electrons have important effects on life and society ranging from the disruption of satellites to the modification of the chemistry of the middle atmosphere and associated effects on climate and the quality of life. As an integral contribution to the LWS program we propose to investigate the basic non-adiabatic processes responsible for the injection, transport and loss of relativistic electrons in the outer radiation zone. Most of the important processes that violate the adiabatic invariants involve interactions with various plasma waves. We propose to utilize existing satellite data to characterise the properties of relevant waves and their variability with solar activity, and then use this data base to evaluate diffusion coefficients to describe the non-adiabatic dynamics of relativistic electrons over the solar cycle. This will allow us to quantify the rates of electron acceleration and loss under different geomagnetic conditions, and thus understand why some disturbances lead to electron enhancement while others lead to net loss. This research is central to NASA's interests in understanding the dynamic response of the near-space environment to solar activity and the coupling between the magnetosphere and the middle atmosphere.

Publication References:

Summary: "

Reference: Richard Thorne / UCLA-Physical Processes Responsible for Relativistic Electron Variability in the Outer Radiation Zone over the Solar Cycle

Summary: no summary

Reference: Summers, D.; Ma, C.; Meredith, N. P.; Horne, R. B.; Thorne, R. M.; Anderson, R. R.; (2004), Modeling outer-zone relativistic electron response to whistler-mode chorus activity during substorms, Journal of Atmospheric and Solar-Terrestrial Physics, Volume 66, Issue 2, p. 133-146., doi: 10.1016/j.jastp.2003.09.013

Summary: no summary

Reference:

Thorne, Richard M.; Horne, Richard B.; Glauert, Sarah; Meredith, Nigel P.; Shprits, Yuri Y.; Summers, Danny; Anderson, Roger R.; (2005), The Influence of Wave-Particle Interactions on Relativistic Electron Dynamics During Storms, Inner Magnetosphere Interactions: New Perspectives From Imaging. Geophysical Monograph 159, edited by James Burch, Michael Schulz and Harlan Spence. ISBN: 978-0-87590-424-5 (HB). Published by the American Geophysical Union, Washington, DC, USA, 2005, p.101, doi: 10.1029/159GM07

Summary: no summary

Reference: Summers, Danny; Thorne, Richard M.; (2005), Correction to ``Relativistic electron pitch-angle scattering by electromagnetic ion cyclotron waves during geomagnetic storms'', Journal of Geophysical Research: Space Physics, Volume 110, Issue A1, CiteID A01208 , doi: 10.1029/2004JA010631