A model of the Interplanetary Heavy Ion Environment which included both galactic cosmic rays (GCR) and solar energetic particles (SEP), was developed for the CRRES mission. The model is based on data from the ONR-604 experiment which flew on CRIES. A description of the datasets, analysis software, and cosmic ray model is given, as well as a description of the validation of the model.
Improved Models of the Inner and Outer Radiation Belts  Dec 1995  187 pages
Authors: K. A. Pfitzner; AEROSPACE HUNTINGTON BEACH CA SPACE SYSTEMS
... field routine. The internal routine uses term dropping at large distances as well as improved coding to obtain speed advantages of 1.5 to 35 over the standard internal. A vector potential model of the Chapman-Ferraro currents was developed for the March 1991 event which was observed by the CRRES satellite. This model was used to study the induction electric field and the electric field's importance on particle acceleration during the March 1991 injection event. An analysis using this induction electric field, which was calculated to be as large as .4 V/m, showed that it is capable of large ...

Integrated Efforts for Analysis of Geophysical Measurements and Models  Sep 26, 1997  234 pages
Authors: S. M. Ayer; C. A. Hein; G. P. Seeley; J. N. Bass; M. J. Kendra; RADEX INC BEDFORD MA
... include spacecraft, ionospheric, atmospheric, and astronomical circumstances; data studies of air combat targeting; meteorology including cloud scene simulation and ITASCA expert system; ionospheric scintillations; atmospheric metal deposition; auroral particle and electric field modeling, magnetic field studies for CRRES, atmospheric density models, databases and drag; PL-GEOSpace code for 3D visualization studies; DMSP magnetic field studies: (1) ephemerides; (2) comparison of LOKANGL and 3PACETRACK codes for orbital prediction, and (3) software development for most of these fields of ...

Storm/Substorm Signatures in the Outer Radiation Belt  Jan 15, 1999  10 pages
Authors: A. Korth; R. H. Friedel; C. Mouikis; J. F. Fennell; AEROSPACE CORP EL SEGUNDO CA TECHNOLOGY OPERATIONS
The response of the ring current region is compared for periods of storm and substorm activity, with an attempt to isolate the contributions of both processes. We investigate CRRES particle data in an overview format that allows the display of long-term variations of the outer radiation belt. We compare the evolution of the ring current population to indicators of storm (Dst) and substorm (AE) activity and examine compositional changes. Substorm activity leads to the intensification of the ring current at higher L (l approx. 6) and lower ring current energies compared to storms (L approx. 4). ...

Dawn/Dusk Dropouts Due to Storms/Substorms Near the Outer Radiation Belt: Observations From CRRESS  Sep 20, 2000  11 pages
Authors: C. G. Mouikis; A. Korth; R. W. Friedel; J. F. Fennell; AEROSPACE CORP EL SEGUNDO CA LAB OPERATIONS
We investigate particle dropout events from the dawn flank of the magnetosphere as observed from a variety of instruments on board the CRRESS satellite. All dropouts are observed at magnetic latitudes more than 100 above the magnetic equator. Plasma and energetic electron and ion data help us establish the boundary regimes being sampled. During these events, the magnetic field shows a dramatic change in the field line configuration from a dipole-like to a highly stretched tail-like. The LLBL moved to geosynchronous altitudes and at times the magnetospheric lobe is sampled. We conclude ...

Authors: R. V. Hilner; G. Ginet; T. Hall; E. Holeman; M. Tautz; AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE
... of natural hazards in the near-Earth space environment. Environmental effects range from navigation and communication link outages caused by ionospheric scintillation to satellite system failures caused by intense magnetospheric particle fluxes. Included are models of low-Earth orbit radiation dosages, radiation belt electron and proton flux derived from CRRESS satellite data, auroral precipitation based on DMSP data, the ionosphere and its scintillation effects, cosmic rays and the solar proton environment interplanetary shock propagation, and satellite Single Event Effects probabilities.

Spacecraft Charging: Observations and Relationship to Satellite Anomalies  Aug 1, 2001  24 pages
Authors: J. F. Fennell; H. C. Koons; J. L. Roeder; J. B. Blake; AEROSPACE CORP EL SEGUNDO CA LAB OPERATIONS
... electrons. The SCATHA data was taken in the near-geosynchronous orbit and the HBO data was taken over a wide range of altitudes in a 630 inclination orbit. The SCATHA data showed that the internal discharge rates were related to the intensities of energetic electrons (Ee > 100 keV) and that, statistically, their occurrence peaked near local noon. These results can be understood in terms of the flux levels of electrons that can penetrate shielding. The HBO energetic particle data have been combined with CRRES, GOES, and GPS data to estimate some worst-case levels of internal charging fluxes.

Analysis of Electric Field Data in the Inner Magnetosphere  Feb 15, 2000  8 pages
Authors: John R. Wygant; MINNESOTA UNIV MINNEAPOLIS SCHOOL OF PHYSICS AND ASTRONOMY
Analysis of the CRRES spacecraft electric field data provides better understanding of the role of the electric field in the transport and energization of particles at and within geosynchronous orbit in support of the efforts of scientists at Air Force Research Laboratory to produce dynamic models of energetic particle fluxes.

Magnetospheric Structure and Dynamics: A Multisatellite Approach  May 2000  14 pages
Authors: Jeffrey Hughes; BOSTON UNIV MA CENTER FOR SPACE PHYSICS
This contract focused on five areas of scientific investigation in which significant progress was made during the life of the contract: electrostatic electronic cyclotron harmonic emissions observed by CRRES; tile implications of cross tail plasma gradients on the structure of the auroral zone, plasma distributions in the topside ionosphere; waves and fluctuations seen in the cusp; and ion cyclotron wave group delays.
Installation and Operation of Particle Transport Simulation Programs to Model the
Detection and Measurement of Space Radiation by Space-Borne Sensors
Sep 25, 2003 44 pages
Authors: Stanley Woolf; ARCON CORP WALTHAM MA
... Research Laboratory, Space Weather Center of Excellence (AFRL/VSBXR); (3) construction of realistic flight
sensor computer models; (4) performance of particle transport calculations; (5) space-borne dosimeter simulation
studies; and (6) studies of scattering of grazing incidence protons from surfaces of material constituents of space-
borne X-ray telescopes. The computer programs ITS-ACCEPT and MCNPX were applied to the modeling of the
CEASE and HEP sensors, and the CRRES dosimeter. This document also summarizes our collaboration in
research leading to the publication of two technical papers.

Timescale for Radiation Belt Electron
Mar 31, 2005 11 pages
Authors: Richard B. Home; Richard M. Thorne; Sarah A. Glauert; Jay M. Albert; Nigel P. Meredith; Roger R. Anderson; AIR
FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE
... increases in the-MeV radiation belt electron flux during magnetically disturbed periods. Recent studies show
that electron acceleration by whistler mode chorus waves becomes most efficient just outside the plasmapause,
near L = 4.5, where peaks in the electron phase space density are observed. We present CRRES data on the
spatial distribution of chorus emissions during active conditions. The wave data are used to calculate the pitch
angle and energy diffusion rates in three magnetic local time (MLT) sectors and to obtain a timescale for
acceleration. We show that chorus emissions in the ...

Radial Diffusion as a Potential Source and Loss Mechanism of Relativistic
Electrons in the Outer Radiation Belt
Feb 15, 2006 24 pages
Authors: Y. Y. Shprits; R. M. Thorne; R. Friedel; G. D. Reeves; J. Fennell; D. N. Baker; S. G. Kanekal; AEROSPACE CORP
EL SEGUNDO CA ENGINEERING AND TECHNOLOGY GROUP
... L are seen at energies as low as a few hundred keV. For the same events, high-energy proton channels also
show decrease in fluxes at higher L-values. These observations are consistent with outward radial diffusion
 driven by the loss to magnetopause at L>4. We further examine the viability of the outward radial diffusion loss by
comparing CRRES observations with a radial diffusion model simulation. Model-data comparison shows that flux
variation near geosynchronous orbit can be effectively propagated by the outward radial diffusion to L=4 and can
account for the main phase storm depletions.

Energetic Outer Zone Electron Loss Timescales During Low Geomagnetic Activity
2006 15 pages
Authors: Nigel P. Meredith; Richard B. Home; Sarah A. Glauert; Richard M. Thorne; Danny Summers; Jay M. Albert; Roger R.
Anderson; AIR FORCE RESEARCH LAB HANSCOM AFB MA
Following enhanced magnetic activity the fluxes of energetic electrons in the Earth's outer radiation belt gradually
decay to quiet-time levels. We use CRRES observations to estimate the energetic electron loss timescales and to
identify the principal loss mechanisms. Gradual loss of energetic electrons in the region 3.0