to society by creating a Virtual Radiation Belt Observatory (ViRBO). The observatory will be an open access near real time and long term archive of observed and simulated radiation belt model data. It will enable scientists to test theoretical mechanisms proposed to explain how particles are accelerated and removed from the radiation belts and it will provide improved tools for engineers designing satellites and operators assessing satellite malfunctions. The observatory will capitalize on radiation belt modeling efforts currently underway at institutions throughout the country and support the goals of the electronic Geophysical Year (eGY) endorsed by the world wide community.

SM32A CC: 518 C Wednesday 1030h

Relativistic Electrons in the Earth's Inner Magnetosphere: Observations, Models, and Space Weather Implications II

Presiding: **G D Reeves,** Los Alamos National Laboratory**; J F Fennell,** Aerospace Corporation

SM32A-01 1030h

Characteristics of the March 31, 2001 0630 substorm injection front

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The global field reconfiguration associated with a geomagnetic substorm can have a significant impact on the dynamics of energetic particles (> keV) in the near-Earth tail and inner magnetosphere. For example, the Earthward-propagating wavefront associated with substorm onset can energize and inject plasma sheet particles into the stable trapping region of the inner magnetosphere and potentially provide a seed population of radiation belt particles. The physical characteristics of the injection front, including the amplitude of the perturbation fields, the propagation velocity, and the spatial extent of the wave front, determine the degree to which different magnetospheric populations are affected by the substorm onset. In this work, we examine the substorm occurring at 0630 UT during the March 31, 2001 geomagnetic storm. Using 3d MHD simulations of the event, we analyze the characteristics of the global geomagnetic field prior to onset, and discuss the properties and evolution of the subsequent substorm injection front. Test particle simulations are used to track the motion of ions and electrons moving under the influence of the dynamic substorm fields, in an effort to determine the properties and origin of those particles most effectively injected and trapped in the inner magnetosphere.

SM32A-02 1045h

Observations of Outer Zone Relativistic Electrons during the October-November 2003 Geomagnetic Storms

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We report on the measurements of outer zone relativistic electrons during the months of October and November 2003. This period showed high fluxes of relativistic electrons which resulted from the magnetosphere being driven by strong coronal mass ejections with solar wind speeds exceeding 1000 Km/sec. Our previous studies of electron energization events have shown that they exhibit spatial and pitch angle coherence. Such coherent behavior is indicative of energization of preferred pitch-angle electrons followed by rapid scattering and/or pitch-angle independent energization of relativistic electrons. It is of interest to examine these properties during "extreme" events such as the October-November period when the magnetosphere was subject to extremely intense solar drivers. We will investigate the pitch-angle and spatial coherence of relativistic electrons during the October-November event and compare them with the more "usual" events. We will use data collected by sensors onboard SAMPEX and POLAR which provide full coverage of the outer zone over energies ranging from about 0.5 MeV to about 15 MeV.

SM32A-03 1100h

Extreme MeV Electron Fluxes at Geosynchronous Orbit

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Following the work of Koons [2001], we examine the statistical properties of extremely high MeV electron fluxes at geosynchronous orbit. We extend the analysis to include a variety of timescales and energies using observations from Los Alamos and NOAA/GOES spacecraft. We use the statistical formalism of the generalized extreme value distribution, which represents the probability distribution of the maximum value taken out of a sample of fixed size. By taking the maximum flux observed in many non-overlapping intervals of several days, we can determine whether the maximum flux at Geosynchronous is likely to have a finite upper limit or an exponential or power-law tail. Our analysis indicates that MeV electron fluxes over a broad range of energies and timescales have a finite upper limit, a true worst case. However, the statistical estimate of this upper limit is inherently uncertain. We explore the sensitivity of the flux upper limit to changes in the sample interval. In particular, we find that samples from the declining phase (i.e. 1995) dominate the maximum value distribution.

SM32A-04 1115h INVITED

Predicting Radiation Belt Electron Fluxes and Space Weather Implications

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The intimate connection between the variations of radiation belt electrons and the solar wind velocity was identified soon after the solar wind was measured. This connection was demonstrated by the existence of a 27-day periodicity in the intensities of trapped electrons in the outer radiation belt. This correlation provides the base for scientists to develop various models to predict the variations of MeV electrons in the Earth's magnetosphere. In this presentation, the long-term and short-term variations of outer belt electron fluxes will be reviewed, so will the attempts and results of predicting their variations based on solar wind measurements.

SM32A-05 1130h

Electron Flux Prediction in the Radiation Belt Using Autoregressive Models With Optimally-Estimated Coefficients.

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Linear autoregressive (AR) processes have modeled many natural systems successfully. In this study, fourth and sixth order Kalman filters were used to identify the coefficients in time series of relativistic electron flux measurements in the region 1<L<10, available from SAMPEX. The estimation was done recursively, so that the optimal estimated coefficients up to the time of the most recent input measurement were computed. In addition to coefficient identification, AR model electron flux predictions using the optimal coefficients were compared to actual electron flux measured at the predicted time by SAMPEX, and the prediction accuracy was assessed. Results of this estimation and prediction, across all L-shells, demonstrated that the leading term in the autoregressive model was dominant. Further results indicate a nearly linear dependence in the leading coefficient with L-shell in the range from L=3 to L=10. Through these results, dynamical processes present in the outer radiation belt can be inferred. Autoregressive filters of higher order did not demonstrate marked improvement in their electron flux measurement prediction when compared with actual SAMPEX measurements. These results indicate the need for external inputs as can be provided by ARX models that will include solar wind measurements for improved modeled electron flux predictions.

SM32A-06 1145h

Modeling the Radiation Belt Electrons With Radial Diffusion Driven by the Solar Wind

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A radial diffusion model for predicting the relativistic electron flux in the outer radiation belt will be described. The model was developed by expanding the Li et al. [2001] geosynchronous prediction model, which simulates the relativistic electrons with the radial diffusion equation and a loss term. The diffusion equation is solved by making the diffusion coefficient a function of solar wind parameters. The Li et al. model is extended for prediction inside geosynchronous orbit by making some of the model parameters functions of L to represent the changing environment of radiation belt electrons at different L-shells. Using the extended model, prediction efficiencies of 0.54 and 0.56 were achieved for $L = 4$ and $L = 6$, respectively, for the year 1998 when compared with POLAR measurements at $L = 4$ and LANL geosynchronous measurements. These results, and those for individual storms, will be presented.

SM33A CC: 220 C-E Wednesday 1330h

Magnetosphere-Ionosphere Coupling in the Solar System III Posters *(joint with P, SA)*

Presiding: **B H Mauk,** The Johns Hopkins University, Applied Physics Laboratory**; C J Frank,** Southwest Research Institute

SM33A-01 1330h POSTER

Coupled Model of Storm Time Effects on the Low- to Mid-Latitude Ionosphere

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The details of how magnetospherically driven penetration electric fields couple to the mid- and low-latitude ionosphere and generate large scale variations and structure in the plasma density is of paramount importance to the NASA Living with a Star Program. We are developing a computational tool for self-consistent modeling of the coupled inner magnetosphere-ionosphere system. The approach is to combine two existing, but compatible, computer models which treat different parts of the physical system: the Rice Convection Model (RCM), which models the electrodynamics of the inner magnetosphere;

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