SM51B MCC: Level 1 Friday 0830h

Exploring the Digital Geospace: Modern Methods of Spatial Data Analysis II Posters *(joint with SA, SH, NG)*

Presiding: **D Vassiliadis,** Universities Space Research Association**; R W Schunk,** Utah State University

SM51B-0514 0830h POSTER

Global Assimilation of Ionospheric Measurements (GAIM)

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GAIM uses a physics-based ionosphere-plasmasphere-polar wind model and a Kalman filter as a basis for assimilating a diverse set of real-time (or near real-time) measurements. Some of the data that are assimilated include in situ electron density measurements from the DMSP satellites, bottomside electron density profiles from a network of digisondes, GPS-TEC data from a network of more than 300 stations, and occultation data. GAIM provides specifications and forecasts on a spatial grid that can be global, regional, or local (25 x 25 km). The primary GAIM output is in the form of 3-dimensional electron density distributions from 90 km to the geosynchronous altitude (35,000 km). GAIM also provides auxiliary parameters (N_mF_2, h_mF_2, N_mE, h_mE, slant and vertical TEC) and global distributions of the self-consistent ionospheric drivers (neutral winds and densities, magnetospheric and dynamo electric fields, and particle precipitation patterns). In its specification mode, GAIM provides quantitative estimates for the accuracy of the reconstructed ionospheric densities. In addition to the physics-based, Kalman filter model, we have also developed a Gauss-Markov Kalman filter model and an approximate (semi-physics-based) Kalman filter model. A beta version of the Gauss-Markov model has been running continuously and autonomously since January 1, 2003. This is a regional (mainly over the U.S.), high-resolution, data assimilation model that can assimilate GPS-TEC data from up to 400 of the NOAA CORS ground-based receivers. A global Gauss-Markov Kalman Filter model has been running continuously since July 1, 2003, and this model can assimilate four data types, including Ne profiles from digisondes, in situ satellite densities, GPS-TECs from 300 stations, and occultation data. The status of the models and the relevant scientific applications will be presented.

SM51B-0515 0830h POSTER

Solar Wind Amplification and Distribution Invariance of Short Time–Scale Geomagnetic Variability in the Auroral Zone

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Using a 22–year data set of one–minute magnetometer measurements at an auroral–zone location, a statistical model of short time–scale geomagnetic fluctuations is developed and used to evaluate how geomagnetic dynamics are influenced by different solar wind controlling parameters. The functional form of the probability distribution function (PDF) that describes extreme–value minute–to–minute (greater than 2σ) changes in the ground magnetic field (Δx) in the auroral zone is shown to be independent of solar wind (SW) forcing and nearly independent of the local time and day of year (DOY) variables. Instead of modifying the intrinsic dynamics, as characterized by the functional form of the PDF of Δx, these variables are shown either to amplify or reduce the absolute level of variability of the fluctuations: the primary difference in the PDF of Δx during weak and strong solar wind forcing is its standard deviation; the functional form of the PDF $= f\,[\Delta x/\sigma(\text{DOY,LT,SW})]$ is nearly invariant. In a statistical interpretation, we conclude that differences in solar–generated conductivity, seasonal effects, strength of solar wind forcing and variability, and position of the magnetometer ground station in local time do not change the structure of the dynamics, as characterized by the probability distribution of Δx, but rather serve to amplify the intrinsic dynamics.

SM51B-0516 0830h POSTER

Multi-year analysis of FUV auroral images

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An adaptive image segmentation technique is used with a detector-specific statistical dayglow model to automatically identify auroral morphologies in images from the Polar Ultraviolet Imager (UVI). This algorithm ignores the outlier pixels and segments the rest pixels of the image based on the histogram distribution. The segmented information is stored in a database known as the UVI Online Search Tool that includes image-derived search criteria such as auroral boundaries, integrated power and distribution, and auroral morphology. The database spans the entire UVI mission lifetime (1996 to present) with a 10 minute resolution. This database of image information represents a unique collection of auroral activity that can be used to perform extended (multi-year) studies of auroral variations. This paper will discuss the challenges of automatically extracting features from space-based auroral images and then present samples of synoptic studies enabled by this new approach. Studies include examination for temporal correlation of UVI-derived auroral power deposition with solar wind epsilon as a gauge of the efficacy of magnetopause power coupling, investigation of the morphology of LBH band brightness mean and variance for Bz North conditions, and examination of correlation between IMF orientation and local time asymmetries seen in substorm morphologies.

URL: http://csds.uah.edu/uvi-ost/

SM51B-0517 0830h POSTER

Impact of Global Averaging on UVI-based B_Z North Conductance Estimates

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Dual Lyman-Birge-Hopfield (LBH) band images from the POLAR satellite UVI instrument are used herein to investigate global conductance morphology for B_Z north conditions. An automated data miner was used to nominate candidate LBH images and to correct individual images for UV dayglow. High apogee LBH band images from three successive winter epochs (1997 - 1999) were selected for periods when B_Z was greater than 2 nT for at least 30 minutes. This B_Z selection criteria was chosen to avoid the variability associated with substorm onset/recovery and to allow the polar ionosphere a significant response time to quiescent magnetospheric forcing. Approximately 2000 image pairs survived selection and were used to estimate global maps for Hall and Pedersen conductance (mean and variance) as a function of By polarity. Two methods were used to create mean and variance conductance maps. In the first method, LBH brightness maps in Rayleighs, assembled for the entire B_Z north image ensemble, were used with a neutral atmosphere model to calculate conductance. These brightness maps indicate a B_Y-dependent variance structure in agreement with modeled and observed morphology of polar cap arcs. The second method calculates conductance on an individual image-by-image basis and forms means and variances on an ensemble of conductance maps. A comparison of both methods will be used to assess the most appropriate for use with highly dynamic and structured storm/substorm images.

SM51B-0518 0830h POSTER

Assimilation of Space-Based Ultraviolet Data Into a Recursive Global Ionospheric Model

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The Global Assimilative Ionosphere Model (GAIM) estimates the ionospheric electron density on a 3-dimensional global grid using a first-principles physics model and recursive estimation and optimal filtering techniques such as the Kalman filter. Slant Total Electron Content (TEC), measured using radio transmissions from the Global Positioning System (GPS) and a network of ground receivers, has been thus far the primary data source for the assimilation and specification of the ionosphere. Nevertheless, it has been shown that spectroscopic measurements of prominent optically thin emissions such as 1356Å produced by the radiative recombination of O^+ in the nighttime ionosphere are proportional to the square of TEC. Furthermore, the recent unprecedented measurements by the HIRAAS experiment onboard ARGOS satellite, as well as those made by the GUVI instrument onboard TIMED satellite offer a unique opportunity to incorporate global-scale optical data into GAIM. The focus of the work presented here is twofold: First, we investigate the specification capabilities of GAIM by comparing model-produced UV intensities from GAIM with GUVI measurements; and second, we assess the effectiveness of UV data for specifying the ionospheric electron density by means of data assimilation. In particular, we examine the effectiveness of GAIM in reproducing features in the equatorial ionosphere such as global patterns of the Appleton anomaly as detected recently by GUVI, as well as the ability of GAIM for specifying electron density profiles. Finally, other data sources such as TEC, ionosondes, and incoherent scatter radar measurements will be used for cross comparisons and validation.

SM51B-0519 0830h POSTER

Witnessing a Revolution in Ionospheric Remote Sensing

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By the available evidence we are in the midst of a revolution in ionospheric remote sensing touched off by the illuminating powers of the Global Positioning System (GPS) and the advent of data assimilation techniques for space weather. Hundreds of globally distributed ground GPS stations provide over half a million total electron content (TECintegrated electron density along the receiver-satellite line-of-sight) measurements daily. Furthermore, several existing low-Earth orbit satellites, such as CHAMP, SAC/C and IOX, are equipped with GPS receivers which collect hundreds of globally distributed GPS occultations daily, offering very high vertical resolution (1km) profiles of electron density from the D-region to the topside ionosphere. In about 3-4 years, as several missions featuring GPS occultations are launched, the number of daily GPS occultations will reach several thousands. This global and continuous coverage of the ionosphere is unprecedented and the optimal means of extracting its information content is through data assimilation techniques similar to those used in atmospheric numerical weather prediction. Our presentation will summarize the effort at the University of Southern California and the Jet Propulsion Laboratory for the implementation and evaluation of a global assimilative ionospheric model (GAIM). GAIM is a physics-based 3D Kalman-filter approach capable of ingesting ground and flight GPS TEC, in addition to UV irradiance and in-situ electron density measurements. By incorporating such disparate datasets, GAIM produces a snapshot of the 3D ionosphere every 12 minutes for use in space weather monitoring, prediction and basic plasma physics research. Our presentation will show results of daily GAIM runs performed over the past 9 months and its validation against independent measurements from Topex altimetry, ionosondes, in-situ electron density, and incoherent scatter radars. Furthermore, our presentation will assess the crucial impact of space data for accurate electron density profiling.

SM51B-0520 0830h POSTER

The Role Of Different Data Types In Global Ionospheric Space Weather Maps

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Ionospheric objective analysis algorithms have a variety of different data types available to construct complete, coherent specifications of the ionosphere. The Ionospheric Data Assimilation Three Dimensional (IDA3D) is an objective analysis algorithm that uses GPS slant TEC, LEO radio beacon slant TEC, ionospheric sounder peak electron density, GPS occulation TEC, incoherent scatter radar electron density profile, and satellite in situ electron density measurements to construct reliable, global electron density specifications. By comparing IDA3D results using each data type independently, we will demonstrate the strengths and weaknessess of each data type.

SM51B-0521 0830h POSTER

Determination of the Quiet-Time Current Sheet Thickness Using Geotail CPI Data and Nonlinear Dynamics Modeling

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Computer simulations of nonlinear charged particle dynamics in magnetotail-like magnetic fields have pointed towards the existence of an ion distribution function signature that manifests itself as a series of peaks and valleys. The separation between the peaks and valleys scales as the fourth root of the normalized particle energy. The normalization in turn depends on parameters that describe the magnetic field structure, i.e. the current sheet half-thickness and the ratio of the magnetic field strength at the midplane, B_z, to the magnetic field strength far from the field reversal but still in the plasma sheet, B_0. This signature has been identified in both ISEE-1 and Geotail data. Using Geotail CPI and magnetometer data, it has been shown that the signature may be used to determine the current sheet thickness during quiet-times. In this paper we present the results of a survey of the quiet (Kp $\leq$ 1+) current sheet thickness for X_{GSE} between $-20R_E$ and $-50R_E$ as determined from the ion distribution signature and magnetic field data. We have found clear evidence of the distribution function signature throughout the entire region of interest. Analysis of the data shows a weak general trend for the current sheet to thicken and become flatter (i.e. B_z/B_0 becomes smaller) as we move down tail. An average of all of the data yields a mean current sheet thickness for the region as $0.81 \pm 0.69R_E$.

SM51B-0522 0830h POSTER

Branch Prediction and Speculative Execution in Magnetospheric Forecasting

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Recent advances in the development of integrated models of the Sun-Earth environment are placing increasing emphasis on data assimilation schemes that can maximize the intelligence extracted from our sparse sampling of upwind conditions. One of the schemes proposed is Branch Prediction and Speculative Execution, which consists of making probabilistic estimates of current upstream conditions, and distribute among available machines simulations that assume each of the probabilistically estimated states as initial conditions. As the near-Earth space evolves and near-Earth satellite data are compared with the models, some of the speculatively executed simulations will be proved wrong. At that point the machines that were executing them will be reassigned either to new lines of speculative simulation, or to increase the processing power devoted to more promising simulations already executing. The scheme is particularly suited to Space Weather since our upwind early warning sentries can provide only sparse sampling of the incoming solar wind, while the bulk of our monitors, which can provide significantly better coverage, are located close to Earth and provide much shorter lead times. By the time the data come in from the near-Earth monitors, the forecasts of the speculative simulations are already in hand. CALCHAS is a 3D visualization package that integrates models and data, and is used in the above data assimilation scheme. The package is written in Java 3D, and has a modular design, so that different models and datasets, both real-time and historical, can be seamlessly compared using a variety of goodness-of-fit measures. The scheme gives good results when used with particle simulations and WINDMI, a low-dimensional dynamical model of the coupled Magnetosphere-Ionosphere system (Doxas and Horton, Using Branch Prediction and Speculative Execution to Forecast Space Weather, Geospace Environment Modeling meeting, Telluride, CO, 2002). Numerical perturbation studies of global MHD models will also be presented.

SM51B-0523 0830h POSTER

A Cumulant-Based Approach To Understanding Magnetospheric Dynamics And Predicting Geomagnetic Indices

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Because the magnetospheric response to the solar wind is highly nonlinear, correlation studies have limited utility for understanding magnetospheric dynamics. Information-theoretic quantities provide an elegant alternative that captures the essential features of the correlation function—and more. We employ a nonparametric, cumulant-based, statistical approach to nonlinear dynamics underlying the evolution of the Kp and Dst geomagnetic indices, given solar wind magnetic field and plasma input. We examine the underlying dynamics of the system, the temporal statistical dependencies, the degree of nonlinearity, and the rate of information loss. We find a significant difference in the nature of the nonlinear magnetospheric response between solar minimum and solar maximum. This approach also has the advantage that it is reliable even in the case of small data sets and therefore it is possible to avoid the assumption of stationarity, which allows for a measure of predictability even when the underlying system dynamics may change character. Evaluations of several leading Kp prediction models indicate that their performances are sub-optimal during active times. Possible improvements of these models using our results are discussed.

SM51B-0524 0830h POSTER

Stormtime Particle Energization With AMIE Potentials

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Simulations were conducted to investigate the influence of rapid electric field fluctuations on electron energization in the inner magnetosphere based on the assimilative mapping of ionospheric electrodynamics (AMIE) technique. Simulations for four different magnetic storms were run, namely those that occurred on May 15, 1997, May 4, 1998, September 25, 1998, and October 19, 1998. Here, we have examined the formation of high energy electrons in the inner magnetosphere during these storm events with our recently-developed relativistic radiation belt transport code. The point of this numerical experiment is to show that a simulation of a real event must have the high time resolution electric field input files in order to produce the seed population for the radiation belts, which are often observed to increase in the days following a magnetic storm. Specifically, a cadence of the global electric field pattern of 5 minutes or less produces inner magnetospheric fluxes that are larger (by up to 5 orders of magnitude) than fluxes produced with a longer cadence. Differences were particularly large relative to simulation results with a 3-hour time cadence, analogous to a Kp-driven electric field model.

SM51B-0525 0830h POSTER

Modeling relativistic electron fluxes in the inner magnetosphere with spatially distributed models

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The spatial and temporal dynamics of relativistic electron fluxes are modeled using ARMA-type filters parametrized by L shell in the range 1-10. The filter coefficients are qualitatively different for the 3 regions Pi that make up the range L> 3. Region P0, as well as the slot, are related to a rapid response (< 1 day) to ejecta and clouds, and diffusive dynamics. Region P1 is related to the 2-3 day response to speed variations, such as those of high-speed streams, while region P2 responds to Northward Bz. The fluxes in both regions exhibit diffusive as well as convective dynamics. The filter approach is used to produce effective diffusion coefficients for the flux, and, for P1 and P2, a range of convection speed as functions of L. The predictive capability of these regional models is estimated.

SM51B-0526 0830h POSTER

Adaptive Prediction of Radiation Belt Electrons with the Extended Kalman Filter

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We use an Extended Kalman Filter (EKF) in an adaptive system identification scheme to estimate the time-varying coefficients of multichannel linear prediction filters. This makes it possible to track the nonlinear response of relativistic electrons to changing solar wind inputs using simple linear models. These non-time-stationary response profiles provide a unique, and potentially enlightening, view of the spatial distribution and temporal evolution of the solar wind-driven dynamics governing the Earth's radiation belts. Namely, one is able to more easily identify a variety of time-dependencies (from solar rotation to solar cycle scales) in the coupling efficiency between the solar wind and radiation belt electrons than can help confirm or refute existing physical theories.

SM51B-0527 0830h POSTER

Forecasting the Radiation Belt Environment With Data Assimilation

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We present initial steps toward a forecast model of the radiation belt electron environment, which assimilates available space-based observations into the framework of a physics-based evolutionary model. The model is designed to assimilate particle flux data from spacecraft that span a broad range of L-shells in an orbit near the equatorial plane. For each pass through the modeling region, spatial analysis techniques are used to incorporate observations into the physical model, using the statistical error structures of the model and data to produce an optimal estimate. The analysis algorithm makes use of an empirical magnetic field model, parameterized by forecast solar wind inputs, to convert measured flux into phase space density. The forecast model then solves the radial diffusion equation to evolve the phase space density in time. The assimilation algorithm is validated in a series of experiments, using artificial storm-time particle flux data fabricated by an independent model. The simulated data is compared to the model over the entire modeling region at each time step, providing a global assessment of the model's accuracy over a wide range of magnetospheric activity levels.

SM51B-0528 0830h POSTER

Temporal and Spatial Structure of Substorm Associated High Energy Particle Precipitation

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The evolution of the high-energy electron population through the substorm cycle has been studied directly with in situ observations such as those provided by the LANL-SOPA instruments, and indirectly through precipitation seen via riometers, X-ray imagers, and other instruments. Ground-based and other remote sensing techniques provide the advantage of being able to track such disturbances in both space and time, with caveats including the fact that information about the energy of the precipitating particles is limited. Using data from the 13 instrument NORSTAR (formerly CANOPUS) riometer array in north-central Canada, we are examining a large number of substorm events. We are focussing on a transient "spike" of significant absorption that occurs during most substorm expansive phases. Seen from any one station, the spike lasts several minutes. More globally, it typically takes tens of minutes to propagate across the NORSTAR array. The propagation is in general a combination of azimuthal (ie., East or West) and poleward. In this paper, we present a statistical comparision between the propagation characteristics of the spike and other substorm features such as dipolarization, auroral bulge, Pi2s, and injections. As well, we present a detailed analysis of several events. Our objective is to determine the magnetospheric source of this transient high energy precipitation.

SM51B-0529 0830h POSTER

Automatic Identification of ULF Waves in Triaxial Magnetic Records

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Existing satellite magnetometer data contain numerous ULF wave events. Our complete understanding of these waves requires studying their statistical properties, but most studies rely on manual selection of wave events, which invites bias in the selected events. In addition, manual selection of wave events is extremely time consuming and cannot cope with the expected rapid increase in data collected by the multi-satellite missions in the next decade. This study develops the methodology as well as a computer algorithm for automatic identification of ULF waves in vector magnetic field data. We combine modern time-frequency analysis with statistical tests of spectral peaks in the procedure, which also includes cross correlation and polarization properties. Initial tests on ISEE and Polar magnetometer data show satisfactory results in identifying ULF wave events. Our analysis is also able to reveal delicate details in ULF wave data, such as the drift of field line resonance frequency as the spacecraft moves across L-shells as well as the slight frequency increase within a packet of pearl pulsations. The developed procedure can be used to efficiently establish a catalog of ULF wave events for statistical analysis on the implication of source mechanisms of these waves and on their role in radiation belt and ring current dynamics.

SM51B-0530 0830h POSTER

A Comparison of Wave Mode Identification Techniques.

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Until the advent of the four satellite Cluster mission, the identification of the plasma wave mode was based on the determination of wave properties using dimensionless transport ratios. One of the main drawbacks with these methods is their use of wave properties calculated using simplified plasma models which may not be applicable in all plasma regions. By combining the data sets from the four Cluster spacecraft wave mode identification may be performed based upon data alone. A number of techniques have been developed for this purpose. This paper compares and contrasts the results based upon the phase differencing and K-filtering techniques.

SM51B-0531 0830h POSTER

Wave Mode Identification for a Cluster Magnetosheath Crossing using the Phase Differencing Technique

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The Cluster mission provides a unique data set which can be applied to the problem of plasma wave mode identification. Previous data sets obtained by only single and dual satellites allowed the use of a number of limited techniques to determine plasma wave modes, e.g. calculation of Dimensionless Ratios and application of the Minimum Variance Technique. The fusion of the four satellite Cluster data set enables the determination of the plasma wave mode directly from the data. This paper presents a case study of a Magnetosheath crossing where the phase differencing technique is used to identify the observed plasma wave modes.

URL: http://www.acse.shef.ac.uk/~bates/research/?file=presentations

SM51B-0532 0830h POSTER

The magnetopause transition: Cluster observations

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The transition parameter (TP, Hapgood and Bryant, 1992), for the magnetopause to magnetosheath traversal, reveals an underlying order to magnetopause structure which is not readily seen in time series data

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because of rapid boundary motion (temporal, as opposed to spatial, effects are better revealed in this reordering). The ordering works irrespective of the presence of accelerated flows, wave motions or FTE signatures, but it is not known how the TP is related to spatial boundary-normal distance. Previous application of the TP to AMPTE-UKS and -IRM data identified the total LLBL thickness to be of order 1500 km. The form of the TP variation in boundary aligned co-ordinates (and specifically with normal distance) is likely to be different in each case, however. Since knowledge of boundary orientation, thickness and motion can independently scale the plasma and field signatures across the boundary layer, the four point Cluster data allow us to compare the TP ordering in the context of well defined boundary behaviour and also allows us to look at the effects of reconnection site motions. We investigate a number of magnetopause crossings observed by Cluster on different spatial scales.

SM51C MCC: Level 1 Friday 0830h

The Role of the Plasmasphere in Ionospheric and Magnetospheric Dynamics I Posters *(joint with SA, AE)*

Presiding: **C L Waters,** School of Mathematical and Physical Sciences, University of Newcastle**; P C Brandt,** Applied Physics Laboratory, Johns Hopkins University

SM51C-0533 0830h POSTER

Pulsed Electric Fields at the Nightside Plasmapause

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It has been suggested that the magnetospheric energy is strongly absorbed near the boundary region between hot and cold plasmas and/or near the steep density gradient region. The plasmapause is considered as such a region. Motivated by this suggestion, we surveyed the electric field data from the Polar satellite for March-May 1997. During these periods, the Polar orbits at geocentric distances of 3-7 Re were inbound passes from the northern tail lobe to the plasmasphere in the 2100-0300 magnetic local time (MLT) sector. We found 15 transient electric field enhancements in the form of pulsed signature at/near the plasmapause. Some of the pulsed electric field (PEF) events were accompanied by the magnetic field perturbations. The electric fields of the pulsed structure were roughly polarized in the direction perpendicular to the ambient magnetic field. The PEF events are distributed in the 2100-0300 MLT and from $\sim 5.6^{\circ}$ to $\sim 27.6^{\circ}$ in magnetic latitude. The peak amplitudes of the PEF events are ~2-14 mV/m larger than the averaged electric field value in the plasma sheet. The 10 (3) PEF events were observed while the AL index was gradually increasing (decreasing). The remaining 2 events occurred during the interval of suddenly decreasing AL. We suggest that the PEF events are a manifestation of the energy absorption at/near the plasmapause and discuss whether their source is associated with magnetospheric substorm because their occurrence was on the nightside.

SM51C-0534 0830h POSTER

PLASMA BLOB EVENTS OBSERVED BY KOMPSAT-1 AND DMSP F15 IN THE LOW LATITUDE NIGHTTIME UPPER IONOSPHERE

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Here we report the plasma blob events (plasma density enhancements) that were observed from KOMPSAT-1 (685-km altitude, 2250 LT) and from DMSP F15 (840-km altitude, 2130 LT) in the low-latitude F region. The blobs were observed mostly along the $\pm 15^{\circ}$ magnetic latitudes. Their global distribution showed a season-longitudinal dependence similar to the distribution of the equatorial plasma bubbles. The blobs drifted upward relative to the ambient plasmas, and the electron temperatures and H^{+} proportions were lower within the blobs compared to those in the background. Those characteristics of the plasma blobs show close similarity to the characteristics of the equatorial plasma bubbles. Therefore, it is suggested that the blobs were originated from the lower altitudes by the mechanism that drives an upward drift of the plasma bubbles. The blob events did not occur in a correlated way with the magnetic activity or daily variation of the solar activity.

SM51C-0535 0830h POSTER

Pitch-Angle Scattering of Relativistic Electrons by Electromagnetic Ion Cyclotron Waves in the Magnetosphere

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Electromagnetic ion cyclotron (EMIC) waves which propagate at frequencies near the proton gyrofrequency can interact with relativistic electrons in the outer radiation belt, through cyclotron resonance, and cause pitch-angle scattering. During magnetic storms EMIC wave amplitudes can exceed the level required for strong diffusion scattering and significant electron losses to the atmosphere can occur over many drift orbits. The Combined Release and Radiation Effects Satellite (CRRES) was ideally situated to observe EMIC waves in the middle magnetosphere. In this study observations from CRRES are used to obtain spectral properties of EMIC waves (1-10 nT), and thus determine typical pitch-angle diffusion coefficients, $D\alpha\alpha$, during different phases of a storm. These diffusion rates are then compared to theoretical calculations assuming a simple functional form for $D\alpha\alpha$ based on quasi-linear theory that is valid for parallel propagating electromagnetic waves.

SM51C-0536 0830h POSTER

Effects of asymmetric plasmasphere on MHD waves in a three-dimensional dipolar magnetosphere

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The plasmaspheric region shows relatively strong longitudinal asymmetry in the sense that the location of the plasmapause and the density distribution significantly vary with respect to local time, and this asymmetry effect has been neglected in previous magnetospheric ULF wave studies. In this study, we numerically examine the MHD wave properties of field line resonances (FLRs) and Pi2 pulsations when the inner magnetosphere is assumed to be asymmetric. We use the dipole magnetic field model, but our density model is based on observational data from the IMAGE satellite. We assume an impulsive input in the magnetotail, which can be associated with a substorm onset. Our results suggest that local FLRs appear in both the radial and azimuthal oscillations owing to the asymmetry. Plasmaspheric Pi2 signals appear in the compressional component, but they are more strongly affected by ambient plasmaspheric structure than the FLRs. We compare our results with the observational data of Pi2 events.

SM51C-0537 0830h POSTER

Monitoring of magnetospheric convection near the plasmapause using corotating aurora

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As part of the CRL-UAF cooperative middle atmosphere project, monochromatic imaging observations of aurora and airglow have been carried out at Poker Flat since October 2000. Monochromatic images are obtained every 5 minutes using two all-sky imagers at 10 emission lines. From these data, a new type of aurora which is stationary on the sky with some patch structures was found in the magnetic evening sector by Kubota et al. [2003]. The stationary characteristic suggests that this type of aurora corotates with the Earth. We have investigated this type of aurora in detail using 47 events identified in the period from October 2000 to April 2003. The motion of this type of aurora is not always corotating. Sometimes it drifts slowly. Considering this point, we call this type of aurora 'Quasi-Corotating (QC) aurora' here. QC aurora occurred on geomagnetic quiet conditions (Kp=0-3+)