200 nT. Using the space weather modeling framework (SWMF) we have simulated the possible response of the near-Earth space environment to a coronal mass ejection (CME) which took 18 hours to travel from the Sun to the Earth. We find that the magnetosphere was compressed to within 4 Earth Radii on the dayside and within geosynchronous orbit at all local times. We further find that the timings of the magnetospheric compressions align quite well with the magnetic field measurements of the 1859 storm. We will present results of the ionospheric cross polar cap potential, thermospheric densities and temperatures, ring current strength, and other magnetospheric, ionospheric, and thermospheric quantities through out the CME.

SH52A CC: 519 A Friday 1030h

Solar Wind II

Presiding: **K W Ogilvie,** NASA Goddard Space Flight Center**; I G Richardson,** NASA Goddard Space Flight Center

SH52A-01 1030h

MHD Simulation of the Breakout Model for CME Initiation

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The "breakout" model has been proposed to explain coronal mass ejection (CME) initiation (Antiochos 1998; Antiochos et al. 1999). MHD simulations performed to date of the breakout model have used rather idealized models of the corona. In this work we will describe MHD simulations of the axisymmetric breakout model in which we include the important effect of the solar wind. In particular, our study will focus on the speed of the CMEs produced to see if the breakout model can explain observations of fast CMEs. Research supported by NSF (CISM) and NASA.

SH52A-02 1045h

MHD Modeling of 3D Coronal Eruptions

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We will investigate the evolution and stability of localized coronal magnetic fields as a model for the initiation of coronal mass ejections. Our emphasis will be on relating the topology of the magnetic field to its tendency to erupt. We will study three-dimensional coronal configurations that model the magnetic field of an active region embedded in a global dipolar coronal magnetic field, including the effect of the solar wind. Research supported by NSF (CISM) and NASA.

SH52A-03 1100h

Correlation Among Flare Emissions, CME Acceleration and Enhanced Magnetic Reconnection

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Recent solar observations have shown that the flare emission and the flux rope motion and the magnetic reconnection rate are closely related. Filament eruptions in the lower corona and CMEs in the higher corona are considered as the motion of flux ropes. From the flare-CME-filament observations it was observed that the most intense peak in the flare nonthermal emissions (hard X-ray, microwaves) and the maximum rate of increase in the total soft X-ray emission during the flare rise phase occur at the time of maximum acceleration of the flux rope's rising motion. Moreover, the magnetic reconnection rate obtained from the magnetogram data and horizontally expanding two-ribbon emissions is found to temporally correlate with the flux rope acceleration. We have performed resistive MHD simulations of the temporal evolution of flux rope motion and magnetic reconnection rate by employing a nonuniform anomalous resistivity. The simulation results show that the flux rope's accelerated rising motion is associated with an enhanced magnetic reconnection rate and thus an enhanced reconnection electric field in the current sheet during the flare rise phase. The results are in good quantitative agreement with observations of the acceleration of flux ropes (CMEs) for several CME-flare events. For the X-class flare events the peak reconnection electric field is $\sim O(10^3$ V/m) or larger, enough to accelerate electrons to over 100 keV in a field-aligned distance of 0.1 km and produce an impulsive hard X-ray emission observed during the flare rise phase, consistent with the estimated reconnection rate based on observations. Comparisons of the flux rope height, velocity and acceleration between our simulation results and observed CME-flare events will be presented.

SH52A-04 1115h

Basic Properties of Anisotropic Stellar Wind Expansion in the Fluid Approach

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In the solar wind, which is the prototype of stellar wind, two kinds of particle temperature anisotropy are observed. The proton temperature perpendicular to the interplanetary magnetic field (IMF) is larger than the parallel temperature in coronal holes at the origin of the fast solar wind. This anisotropy can be very large for atomic oxygen ions. This phenomenon is associated to wave-particle interactions. However, it is known that without any particle interaction, the opposite type of temperature anisotropy should develop in the expansion. This is probably the case in the slow solar wind source regions. In both cases, the electron seem to be rather isotropic in the corona but for less collisional medium the anisotropy should increase. This presentation is devoted to an analysis of dynamical properties of stellar atmosphere in the presence of the two kinds of temperature/pressure anisotropy. We choose to consider the one fluid approach in order to focus on the basic properties. The hydrostatic equilibrium conditions, the transcritical solution properties, the expansion velocity and the mass loss rate are analyzed for anisotropic isothermal and non-isothermal atmospheres. The extension of such analysis to two fluid models and multimoment models established for weakly collisional stellar winds are discussed.

SH52A-05 1130h

Evidence for Coexisting Hot and Cool Polar Coronal Jets - Coordinated Observations of SOHO and TRACE

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The polar coronal jets were first observed by SOHO instruments (EIT, LASCO, UVCS) during the last solar minimum. They were small, fast ejections originating from flaring UV bright points within large polar coronal holes. The polar holes disappeared at solar maximum and the jets were not visible anymore. Currently, however, as the Sun's activity declines, the polar holes again became permanent structures and new polar coronal jets were observed by specially designed SOHO Joint Observing Program (JOP 155). Their frequency of several events per day appear comparable to the frequency from last solar minimum. Also, the speed of $\sim$ 400 km s^{-1} at 1.6 $R_\odot$ is consistent with typical velocities of polar jets in 1996-1998. The ejections are believed to be triggered by the field line reconnection between the emerging magnetic dipole and pre-existing unipolar field. Existing models predict that the hot jet is ejected together with another jet made of cool material. The coordinated SOHO and TRACE observations within JOP 155 provide unique opportunity to test this prediction. We will present observations and discuss evidence supporting the model.

SH52A-06 1145h

The Cassini Solar Conjunction Faraday Rotation Experiment

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The Cassini Solar Faraday Rotation Experiment was conducted during the spacecraft's solar conjunctions in 2002 and 2003. A total of 160 hours of open-loop radio science data was collected at frequencies of 8 and 32 GHz (X- and Ka-bands), i.e., frequencies much higher than the plasma frequencies, but sufficiently low to undergo measurable Faraday rotation in the solar corona. During the 2002 experiment, four Coronal Mass Ejections crossed the signal ray path between Cassini and the Earth, each one imparting a different signature in the radio sounding data. The first occurred during the day of conjunction when the spacecraft's signal ray path passed to within approximately 2 solar radii of the Sun's center. The second occurred 1 day later at a solar offset distance of 3 solar radii. As shown by the EIT imager on SOHO, this event was oriented almost perpendicular to the first CME. It had a significant impact on the signal, causing the Ka-band translator on Cassini to lose lock on the uplink signal from Earth. The 3rd and 4th CMEs occurred 2 days later as a paired event when the Cassini solar offset was roughly 5 solar radii. The data received during the minimum solar elongation attained during the 2003 conjunction (proximate ray path point: 1.25 solar radii) were highly variable and represent the closest radio occultation measurement to the surface of the Sun. We discuss the Cassini Faraday Rotation data and develop models of the coronal electron density and magnetic field to simulate the measurements.

SH53A CC: 220 C-E Friday 1330h

Violent Sun-Earth Connection Events of October-November 2003 II Posters

(joint with SA, SM)

Presiding: **T H Zurbuchen,** University of Michigan**; Q Zong,** Boston University

SH53A-01 1330h POSTER

Spectral and dynamical properties of October-November 2003 storm injected electrons as observed by TSX5/CEASE

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The Air Force Research Laboratory Compact Environmental Anomaly Sensor (CEASE) includes a particle telescope (two stacked solid state detectors) that provides several electron channels with threshold energies from 55 keV to 550 keV, and two dosimeters that respond to >1.2 and >3.5 MeV electrons. The first CEASE to fly was launched on the USAF Space Test Program TSX-5 spacecraft on 6 June 2000 into a 410 km by 1750 km, 69 degree inclination orbit and continues to return data up to the present. An intense solar proton event commenced on 28 October 2003, and was followed by a very large geomagnetic storm with two distinct Dst minima recorded on 30 October at 01 hr UT (-363 nT) and 23 hr UT (-401 nT). An intense injection of electrons into the slot region followed, with >1.2 MeV fluxes peaking at approximately L=2.5 on 02 Nov and subsequently decaying away over the next several weeks. The injection was strongly energy dependent, with very different radial and temporal injection profiles observed in the various CEASE channels. The details of the energy-dependent injection and decay profiles will be examined closely to provide a better understanding of the dynamics of this storm interval that raised considerable havoc on a number of spacecraft.

SH53A-02 1330h POSTER

Variations in Radiation Belt Structure during the Storm Period of 28 Oct - 21 Nov 2003

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During the geomagnetically active period of 28 Oct - 21 Nov 03 measurements of the Earth's radiation environment were made by the Compact Environment Anomaly Sensor (CEASE) flying on the DoD Space Test Program TSX-5 satellite in an 410 x 1710 km, 69 degree low-Earth orbit. CEASE comprises two dosimeters, two particles detectors and a solid-state single event upset detector capable of measuring integral and broad differential fluxes of electrons in the range 60 keV to > 6 MeV and protons in the range from > 5 MeV to approximately 120 MeV. The orbit of TSX-5 permits observations of energetic particles in the loss cone and those trapped at low values of equatorial pitch-angle in the horns of the radiation belts. Protons from the solar proton events beginning on 28 Oct 03 and 2 Nov 03 are readily seen in all energy channels penetrating to magnetic L-shells of approximately 2.4 and 3.3, respectively. An electron radiation belt in the "slot" region from L approximately 2.0-3.0 is formed as a result of the solar wind shock impact on 29 Oct 03 and reaches a maximum intensity over two orders of magnitude above background count levels on 2 Nov 03, thereafter decaying to a level approximately one order of magnitude above background on the last day of reported observations (21 Nov 03). The outer zone belt between L approximately 3-5 disappears after the impact of 29 Oct 03 but slowly rebuilds itself continuously building in intensity until it is completely wiped out again by the shock impact on 20 Nov 03. For a period of at least several days between 29 Oct 03 and 21 Nov 03 there are three distinct radiation belts: the inner belt, a new slot region belt, and the outer zone. Details of the CEASE electron and proton data covering this intriguing time period will be presented.

SH53A-03 1330h POSTER

First Results From the SSJ5 Precipitating Particle Sensor on DMSP F16: Simultaneous Observation of KeV and MeV Particles During the 2003 Halloween Storms

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The first SSJ5 auroral electron and ion spectrometer was launched on the F16 spacecraft of the Defense Meteorological Satellite Program (DMSP) on 18 October 2003, and started providing data on 27 October 2003. This sensor replaces the highly successful SSJ4 series of particle spectrometers (ten SSJ4s launched between 1982 and 1999). The SSJ5 has mass 3.2 Kg, nominal power 1.4 W, and size 23 x 15 x 15 cm^3. It is an electrostatic analyzer with triquadrisphere geometry, and a 90^o x 4^o field of view. The 90^o zenith to horizon dimension is divided into six 15^o angular sectors. Electron and ion counts at 19 energies, from 30 KeV to 30 eV, are measured each second, with a dwell time of 50 msec per energy channel. The instrument can be run in either of two formats. In Format A, particle counts from all six angular sectors are summed once per second. This emulates the temporal resolution of the SSJ4, which does not have angular zones. In Format B, particle counts from the six angular sectors are provided one zone at a time to provide enhanced pitch-angle resolution. In this format, the particle counts for each zone have been summed over the previous six seconds. The instrument has been run for extended time periods in both Format A and B. While Format B has reduced precision for determining features such as auroral boundary crossings, it is useful for characterizing the degree of anisotropy of the particle fluxes. The SSJ5 sensor was turned on in time to catch the Halloween storms of 2003, and provided an excellent data set. In addition to the expected 30 KeV - 30 eV particles that entered the instrument through its apertures and traveled along the intended triquadrisphere paths until they reached the microchannel plate (MCP) detectors, the data included MeV particles that are interpreted as having penetrated the side of the instrument. The SSJ5 MCP detectors are much more sensitive to these MeV particles than the SSJ4 channeltrons due to the larger sensitive area of the MCPs. SSJ5 data during and after the storms showed enhanced outer zone electron horns. SSJ5 data from the first several months of operation are compared with SSJ4 data from other DMSP spacecraft.

SH53A-04 1330h POSTER

Low Frequency Geomagnetic Field Fluctuations at Different High Latitude Stations During October 29-31, 2003

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In this work we present a study of the low frequency geomagnetic field fluctuations detected at high latitude in the period October 29-31, 2003; this period is characterized by the Earth's arrival of solar wind CMEs, which on one hand produced major geomagnetic storms, on the other hand were characterized by long-duration intervals with northward interplanetary magnetic field and high solar wind speed. We analyze geomagnetic field data recorded at the three antarctic stations Terra Nova Bay, Scott Base and Dumont D'Urville, located at the same geomagnetic latitude (about 80S) but at different magnetic local time (about MLT=UT-8, MLT=UT-7 and MLT=UT-13, respectively). The analysis is extended also to the canadian station Cambridge Bay, which has the same magnetic local time and almost opposite corrected geomagnetic latitude as Terra Nova Bay.

SH53A-05 1330h POSTER

Cluster/RAPID-IIMS Observations of Heavy Ions in the Near-Earth Environment in Response to the Geomagnetic Storms of October/November 2003

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The interval spanning the end of October and beginning of November 2003 was characterised by extreme solar activity that resulted in a series of intense geomagnetic storms. We present a study of associated enhancements in the energetic ion population observed by the RAPID (Research with Adaptive Particle Imaging Detectors) experiment onboard Cluster, which can detect energetic ions in the range of a few tens of keV up to several MeV. During this interval, the apogee of Cluster, which is at 19.6 RE, lay nominally in the pre-midnight sector of the magnetotail. However, the magnetosphere compression induced by the storms resulted in several incursions by the spacecraft into the magnetosheath, which is not normally encountered at this local time. Although the RAPID instrument does not provide ion charge state information, we are nevertheless able to use the heavy ions (Fe to Si) as tracers for the entry of plasma of solar wind origin into the confines of the magnetosphere. Using the RAPID data we provide a preliminary assessment of the particle energisation and entry time-scales, which are crucial factors in the modelling of the entry mechanisms and geo-effectiveness of geomagnetic storms.

SH53A-06 1330h POSTER

The relative size, amplitude, and duration of geomagnetic activity of the October 29-31 and November 20-21 storms

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We present a statistical analysis of geomagnetic activity that compares the size, amplitude, and duration of geomagnetic activity during the October 29-31 and November 20-21 storms. The data set includes Ap measurements beginning in 1932, Dst records starting in 1963, 1-minute ground magnetometer data beginning in 1975, and 1-hour magnetometer data starting in 1925. The probability distribution functions of size, amplitude, and duration of geomagnetic activity are shown to all have heavy tails, and approximate functional forms are derived. The derived probability distribution functions are then used to show that the October and November 2003 storms both fell in the top one percentile or higher in terms of size, amplitude, and duration of their associated geomagnetic activity.

URL: http://lasp.colorado.edu/∼weigel

SH53A-07 1330h POSTER

Magnetospheric Responses to Extreme Solar Wind Conditions and Dst Prediction for October-November 2003

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An explicit model for predicting Dst based on solar wind data for the years 1995-1999 gives a good fit with a prediction efficiency of 88%, a linear correlation coefficient between the Dst index and the model of 0.94, and a RMS error of 6.4 nT. The same model applied to the first half of 2000 gave a prediction efficiency of 91%, a linear correlation coefficient of 0.95, and a RMS error of 7.9 nT. During the years 1995-1999, the solar wind parameters measured by Wind and ACE seemed rather tamed: solar wind speed remained below 1000 km/s and the z-component of interplanetary magnetic field, Bz, was never below -40 nT. More violent solar wind conditions were recorded recently. For example, during October-November 2003, Bz was twice below -50 nT and solar wind speed was above 1500 km/s for extended time. We will show that how the prediction model works under such extreme conditions and discuss the implication. In addition, we attempt to infer the solar wind speed based on the our model prediction, assuming the Dst index, Bz, and solar wind density are accurate.

URL: http://lasp.colorado.edu/~lix

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SH53A-08 1330h POSTER

Energetic Neutral Atom Response to the Interaction Between the Solar Wind and the Dayside Magnetosphere During the Halloween 2003 Geomagnetic Storm

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By 31 October 2003—the day after the SWICS instrument on ACE measured solar wind speeds peaking at ∼2000 km/s for the second time in as many days—the solar wind had slowed to ∼1000 km/s and the solar wind He thermal speed had dropped sharply from ∼400 km/s to <10 km/s, indicating the presence of cold plasma near the Earth. From ∼0545 to 0715 UT, while the IMAGE spacecraft was near or possibly within the magnetosheath, the LENA instrument detected neutral H over a 180° range, 50% wider than the typical angular extent. In three hours, from ∼0330 to 0630 UT, the real-time Dst index recovered rapidly from -204 to -57 nT and the solar wind thermal speed increased from ∼20 km/s to a maximum of ∼50 km/s. Starting about two days earlier, the peak 2- to 6-MeV electron flux measured at SAMPEX moved in from L =∼3.5 to ∼2.5, filling the slot region. During this unique Halloween 2003 geomagnetic storm period we examine the influences the extreme solar wind states had on the magnetosphere. In particular, we focus on the energetic neutral atoms produced by the interaction between the shocked, heated, and redirected solar wind plasma of the magnetosheath and the neutral H atoms of the Earth's exosphere. When the magnetosphere is compressed, the ions in the magnetosheath have the potential to interact with denser layers of the exosphere, producing more neutrals through charge exchange. We investigate which factors—e.g., solar wind parameters, relative position of the spacecraft, geomagnetic indices, etc.—are primarily responsible for the unusual LENA measurements, and compare this event to less extreme time periods.

SH53A-09 1330h POSTER

Investigation of Field-Aligned Current variations during the intense geomagnetic storms of October-November 2003

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During October 22 to November 04 2003 there was a very intense period of solar activity giving rise to three large coronal mass ejections. These drove some of the largest geomagnetic storms of the current solar cycle, with Dst reaching -350 nT and auroral displays seen as far equatorward as Texas. In this paper we present field-aligned current patterns determined from the Iridium constellation magnetic field data and investigate how these patterns change in response to the variations in the solar wind driver. By combining these ionospheric current measurements with estimations of conductance from the Polar/VIS earth camera, we will study the effects of the enhanced conduction paths on the field-aligned currents, especially in the nightside ionosphere.

SH53A-10 1330h POSTER

Dynamics of O^+ ions during the October 2003 storm observed by Geotail/EPIC and IMAGE/LENA

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We studied dynamics of O^+ ions during the storm on October 30-31, 2003, using data from the EPIC instrument on board the Geotail satellite and the LENA instrument on board the IMAGE satellite. During the main phase of the storm, the Geotail satellite was located in the near-Earth region (X∼−8 R_E), where Geotail measured energetic (9-210 keV/e) ion flux in the plasma sheet; and the IMAGE satellite was at altitude of 6-8 R_E on the morningside, where IMAGE measured ENA of 10 eV to ∼1 keV generated by charge exchange with ionospheric outflow ions. From Geotail observation we found that the H^+ energy density during the storm was almost similar to those in quiet times, while the O^+ energy density showed large enhancements during the storm. The O^+/H^+ energy density ratio was found to reach 10-20 near the storm maximum, which is the largest ratio in the near-Earth plasma sheet ever observed by Geotail. Previous studies with Geotail data have shown that the increase of the O^+/H^+ energy density ratio is caused by mass-dependent acceleration of ions in the plasma sheet. However, the energy density ratio changes can be also caused by additional supply of O^+ ions from the ionosphere to the plasma sheet. To test this idea, IMAGE/LENA data were examined. We found a distinctive increase of LENA count ∼1 hour before the time when the O^+/H^+ ratio in the plasma sheet was maximum. (The POLAR/TIDE investigation also recorded peak dayside auroral outflow fluxes of O^+ ions that were among the largest ever observed at ∼2-3×10^{14} $m^{-2}s^{-1}$.) From these observations we suggest that O^+ ions are extracted from the ionosphere during the storm and they are transported to the plasma sheet via the magnetic lobe. One hour delay from the increase of outflow flux to the O^+/H^+ peak may reflect traveling time from the ionosphere to the plasma sheet.

SH53A-11 1330h POSTER

Density Perturbations in the Inner Plasmasphere During Huge Magnetic Storms in October-November 2003 : Ground-based Observations

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The inner plasmaspheric plasma density can be inferred from the observed field-line eigenfrequency if appropriate models of the magnetic field and the plasmaspheric plasma density are assumed. We can identify field-line eigenoscillations and measure their frequencies by applying the cross-phase method [*Waters et al., 1991*] and the amplitude-ratio method [*Baransky et al., 1985*] to magnetometer data from two stations closely located along the same meridian. By using four ground magnetometers located at L = 1.32 − 1.41, we have monitored the plasmaspheric plasma density at L = 1.32 − 1.41 during the interval from Oct. 24 to Oct. 31, 2003, in which a series of CMEs hit the magnetosphere and triggered two large storms in a consecutive manner. The density was monotonically decreased from 06LT to 16LT on Oct. 25, when a CME hit the magnetosphere but did not trigger a magnetic storm; the density at 16LT was half that at 06LT. On the other hand, the density was significantly increased to about two times the pre-storm value from 06LT to 12LT on Oct. 29, during the main phase of the first magnetic storm. We note that we have found the same feature (an increase in the plasma density during the main phase of a magnetic storm) for the second storm, too (from 06UT to 12LT on Oct. 31). We will discuss the response of the inner plasmasphere to the magnetic storms.

SH53A-12 1330h POSTER

The Effects of High Latitude E-field Perturbation into the Mid- and Equatorial Ionosphere During the Magnetic Storm of October 29-31, 2003

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Multiscale plasma structuring created by the penetration of the magnetospheric electric field into the mid- and equatorial ionosphere is described. Space-based and arrays of ground-based instruments in the continental US (CONUS) and at equatorial latitudes in the Atlantic sector are used for this study. Dramatic enhancements of GHz phase fluctuations and UHF amplitude scintillations are observed in the normally benign mid-latitude region when the Polar Ultra-Violet Imager observed the auroral oval to be located across CONUS. Almost simultaneously, the DMSP satellites in the approximately 2100 LT time plane observed longitudinally confined severe uplift of the equatorial ionosphere as was seen during the Bastille Day Storm in July, 2000. Equatorial scintillation and TEC behavior over the Atlantic and the South American continent are presented using TOPEX satellite data and measurements from a dense array of GPS receivers along the western coast of South America. Effects of such severe phase and amplitude fluctuations on satellite based communication and navigation systems are assessed.

SH53A-13 1330h POSTER

Topside Ionospheric Upflow from DMSP Measurements During the October and November 2003 Storms

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We have examined characteristics of the vertical ion flux of O^+ in the topside high-latitude ionosphere before and during the October and November, 2003 geomagnetic storms using measurements of the vertical ion drift and ion number density made by the DMSP F13 and F15 spacecraft. Prior to storm onset typical upward fluxes of approximately 10^8–10^9 $cm^{-2}s^{-1}$ are observed in the auroral zones with somewhat smaller downward fluxes in the polar caps. Immediately following storm onset upward fluxes reach and sometimes exceed 10^{10} $cm^{-2}s^{-1}$ and are observed with vertical

velocities of over 500 m s^{-1}. At the same time downward fluxes at the higher latitudes reach unusually high values of 10^8–10^9 $cm^{-2}s^{-1}$. As the storm continues the topside ionosphere number density is depleted in regions of upward motion and the upward fluxes fall back to more typical values even though the vertical velocities remain elevated.

SH53A-14 1330h POSTER

Observations of Ionospheric Effects During the October-November 2003 Storms

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During the October-November 2003 magnetic storm events, DMSP satellites which orbit the Earth at altitudes of 840 km detected some of the largest electric fields, field-aligned currents (FACs) and highest ionospheric densities ever seen with these spacecraft. The F-layer in the ionosphere within 15 degrees of the equator was lifted up above 800 km repeatedly due to penetration electric fields which alternately intensified and were shielded over the course of the very extended main phase. At times unshielded Region 1 FACs exceeded 1 A/m, the equatorial boundary of the auroral zone moved to geomagnetic latitudes below 55 degrees, and sub-auroral polarization stream (SAPs) speeds approached 1 km/s. We will discuss the consequences of energy dissipation represented by the large electric and magnetic field perturbations, the source in the magnetosphere to which the measured fields map, and place this superstorm in the context of other major storms we have studied.

SH53A-15 1330h POSTER

THE NEUTRAL WIND FIELD AT SONDRESTROM (KANGERLUSSUAQ), GREENLAND DURING THE SUPER-STORMS OF OCTOBER AND NOVEMBER, 2003

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The thermospheric neutral wind field at Sondrestrom (Kangerlussuaq), Greenland is routinely monitored at two independent altitudes by a Fabry-Perot interferometer. Routine synoptic observations have been conducted since 1983, including the storms of March 1989, and the recent events in October and November 2003. The location of the aeronomical observatory places it under the auroral oval during dusk and dawn and within the polar cap during the midnight sector. During all of these storm periods, severe modifications to the upper thermosphere have been observed. These include significant heating and enhanced horizontal wind flow. Neutral temperature in the upper thermosphere has been observed to increase above 2000K, while zonal winds have increased from a few hundred to as high as 700 m/s. This paper will describe the neutral wind field during these storm events. Measurements of the local wind field will be placed into the global context as observed by the TIDI instrument aboard the TIMED satellite. It is unclear that current general circulation modeling can succeed at predicting the horizontal wind flow without resorting to finer time steps in their calculations.

SH53A-16 1330h POSTER

Thermospheric Infrared Emission Response to Major Geomagnetic Disturbances From SABER Data: High Latitude Aurora and X-ray Flares

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TIMED/SABER data indicate an intense response of infrared emission from the Earth's upper atmosphere to geomagnetic disturbances. This is especially true for nitric oxide in the 5.3-μm band, where there is a dramatic enhancement in response to major geomagnetic storms. The emission rate increases by more than a factor of 10 and the enhancement extends equatorward into the subtropics far from the auroral zone. Accompanying the large storms are large X-ray flare events. These short-lived events are often embedded in periods of increased auroral activity. We will examine strong flare events to extract any signature in the nitric oxide emission. In order to separate flare response from the larger and more extended auroral enhancement, we bin data from various latitudes and local times before and immediately after large flares. The large flares of October and November 2003 provide a clear enhancement in nitric oxide that is smaller than, but distinct from, the aurorally induced nitric oxide enhancement.

SH53B CC: 519 A Friday 1330h

Solar Wind III

Presiding: **M E Hill,** University of Maryland**; A Szabo,** NASA Goddard Space Flight Center

SH53B-01 1330h

Solar Wind Plasma Composition Variations Associated With Interplanetary Coronal Mass Ejections

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We summarize the variations in solar wind plasma composition observed by the ACE/SWICS instrument during the near-Earth interplanetary coronal mass ejections (ICMEs) in 1996-2002 identified by *Cane and Richardson* [2003], and compare these with variations in the composition of the ambient solar wind, for example dividing the ICMEs into those with and without "magnetic cloud" signatures, or by whether they are preceded by halo/partial halo CMEs observed by the LASCO coronagraphs. We also develop a set of simple criteria that characterize the compositional anomalies associated with ICMEs, and assess their success in identifying ICMEs from the composition data. The CR03 survey of the occurrence rate and properties of ICMEs during solar cycle 23 will also be updated. H. V. Cane and I. G. Richardson, *J. Geophys. Res., 108*, A4, 1156, doi:10.1029/2002JA009817, 2003.

SH53B-02 1345h

Magnetic Loop Topologies in the Vicinity of the Heliospheric Current Sheet

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Suprathermal electron observations obtained in the vicinity of the heliospheric current sheet (HCS) suggest that, in addition to open magnetic field lines, limited intervals of closed and/or disconnected field lines (inferred from counterstreaming electron beams and strahl dropouts respectively) are often present there. Further, the observations show that the suprathermal electron flow polarity (parallel or anti-parallel to the magnetic field) reversals and magnetic field polarity reversals do not always occur simultaneously. Using observations from the solar wind experiment on ACE obtained in the vicinity of the HCS, we find that the intervals of inferred closed and/or disconnected field lines commonly are observed either immediately before or immediately after the magnetic field polarity reversals. We interpret these observations in terms of small-scale magnetic loops propagating through and displacing the HCS. The loops are inclined relative to the ecliptic plane and can be doubly or singly connected to the Sun or entirely disconnected from it. The one-sided aspect of the closed and disconnected intervals relative to the field reversal arises because the spacecraft typically samples only one leg of a given magnetic loop. Our model also provides a natural explanation for timing offsets between electron flow reversals and magnetic field polarity reversals. Although the small-scale HCS-related magnetic loops considered here would not nominally be identified as coronal mass ejections (CMEs) in the solar wind, our discussion pertains equally well to topological aspects of magnetic loops associated with CMEs. For example, our simple model indicates that CMEs do not typically form occlusions in the HCS, contrary to previous suggestions.

SH53B-03 1400h

Correlation of Solar Wind Parameters Between SOHO and Wind

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The solar wind is a turbulent plasma in which shocks, waves, and discontinuities are observed to propagate away from the sun. Comparing data from several spacecraft in different places can yield information about the nature of these disturbances and their development. Among others, the present authors have studied correlations between Wind and SOHO plasma data for the period 1996 to 1999. In this paper we extend this work to cover the maximum of solar cycle 23 in the years 2001 and 2002. The observations are spaced 96 seconds apart and are correlated over 2-hour periods. We confirm a dependence of the mean value of the correlation coefficient upon solar activity, decreasing from 0.54 in 1996 to 0.47 in 2000. Using a list of shocks observed during the period 2000 and 2001, we find their directions of propagation to be distributed about the radial direction in a cone with a half angle of about 20 degrees, and a tendency for discontinuities to occur at angles grouped about the Parker spiral direction, as also earlier demonstrated by Coplan et al. and by the MIT group. In order to emphasize short time scale disturbances the data have been prewhitened. Correlations of these prewhitened data provide additional information about the evolution of solar wind stuuctures.

SH53B-04 1415h

Nature of the Solar Wind Electron Distribution Functions in the Slow and Fast Solar Wind at 1 AU

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