SH42A CC: 518 A Thursday 1030h

Violent Sun-Earth Connection Events of October-November 2003: Geospace Impact II *(joint with SA, SM)*

Presiding: **C Farrugia,** University of New Hampshire**; X Li,** University of Colorado

SH42A-01 1030h INVITED

Violent Sun-Earth Connection Events of October-November 2003 and the Earth's Radiation Belts

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The response of the Earth's radiation belts to the events of October-November 2003 were complex and differed in interesting ways from other remarkable events in the past several years. In contrast to the two events in November 2001, no new, long-lasting ion belts were formed, and those persisting from the November 2001 event were unaffected. However energetic electrons were injected deeply into the slot region, and included energies up to several MeV, but not above 10 MeV. ESP electrons with energies above 10 MeV were seen for several hours, and penetrated to L = 3.5, but apparently not injected into the radiation belts. Data from SAMPEX, Polar, HEO1, HEO3 and MEO1 will be used to illustrate these and other happenings during this period of intense solar and geomagnetic activity.

SH42A-02 1050h INVITED

Impact of Fast CMEs on Ring Current During October-November 2003 Super Storms

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We survey the major impacts, on the terrestrial ring current, of a series of fast coronal mass ejections that occurred in October and November 2003. Our study focuses on the energetics of the ring current ions (with energy range of tens of keV) trapped by the geomagnetic field. Fortunately, the good coverage of satellite orbits in various regions enables us to monitor how the ring current responds to the unusual variation of the solar wind and the interplanetary magnetic field (IMF) during these super storms. The DMSP F13 satellite provides measurements of the polar cap potential drop which is the total strength of convection, and saturation of the polar cap potential drop is evident. An excellent constellation of LANL satellites provides temporal and spatial variation of the source population of the ring current (plasma sheet density and temperature) at the geosynchronous altitude. The low-altitude NOAA 17 satellite continuously monitored the temporal evolution of the trapped and precipitating particles with energy greater than 30 keV. An extremely deep penetration of the ring current ions was detected on November 20, with 30-80 keV ions reaching L=1.5 or less. The IMAGE satellite captured the global distribution of the ring current protons by measurement of the energetic neutral atoms (ENAs), even though the IMAGE/HENA instrument suffered from extremely ENA high count rates when IMAGE was at low altitude during the super storms. On October 29th, IMAGE/HENA monitored an abrupt injection and exhaustion of the ring current protons due to a spike of negative IMF Bz that reached -40 nT and lasted only for about 7 minutes, according to Geotail/MGF just upstream of the bow shock. This short-lived and highly-intensive spike depressed SYM (as a proxy of Dst) to about -300 nT within 1 hour. Simulations are performed with the Comprehensive Ring Current Model to investigate the physical processes governing the ring current during the super storms. An initial result of the simulation is that the rapid recovery of the ring current as indicated by Dst cannot be solely attributed to charge exchange with neutral atoms during the storms. Unusual pitch angle scattering (leading to precipitation into the atmosphere) or other processes (decrease in the plasma sheet density and temperature) may be required.

SH42A-03 1110h

Global Modeling of Magnetospheric Effects of the October-November 2003 Geomagnetic Storms

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The large magnetic storms of October-November 2003 provide us with a unique opportunity to study the response of the magnetosphere to extreme solar wind and interplanetary magnetic field conditions. While these storms did not stand out in terms of Dst size, they are associated with unprecedented values of the solar wind speed. Although the solar wind measurements were contaminated by solar energetic protons, the efforts of the ACE team have yielded a reliable data set that allows us to model this event with high-quality input data to our model. In this talk we present results from global simulations of these events. Specifically, we discuss the response of the magnetopause, the evolution of the cross polar-cap potential, and the evolution of the open flux in the geomagnetic tail.

SH42A-04 1125h INVITED

Simulation of the Halloween Magnetic Storm

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A central goal of the Center for Integrated Space Weather Modeling is to understand the intense solar and resulting terrestrial activity that occurred from October 22 to November 04 2003. In this paper we focus on the geospace impact toward the end of this period, October 29 to November 1. Using upstream solar wind data, we simulate the response of the earth's magnetosphere and ionosphere/thermosphere in two ways. First we use the Lyon-Fedder-Mobarry (LFM) global MHD code to simulate both the magnetosphere and ionosphere. In addition, we simulate this period with the version of LFM that we have coupled to the NCAR Thermosphere Ionosphere Nested Grid (TING) code, in which. TING replaces the height integrated ionosphere model integral to LFM. We have attempted to use as accurate solar wind observations as possible for our simulations. To this end, we have attempted to ameliorate the effect of flare particles on the ACE plasma measurements by using SOHO and WIND data. We will compare our results with the available magnetospheric and ionospheric observations, in particular AMIE results and observations from geosynchronous satellites. [This work is supported by NSF grant ATM-0120950].

SH42A-05 1145h

Energized Ions in the Dayside Magnetosphere During the SEC Events of Late October 2003

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The strong solar wind disturbances of late October 2003 produced dramatic consequences in the magnetospheric environment at geosynchronous orbit, including numerous magnetopause crossings, encounters with polar cap field lines, extensive intervals of extremely dense plasma sheet, and strong flows of field-aligned ions, reaching energies above 10 keV. In apparent association with sudden dynamic pressure variations, temporal bursts of field-aligned ions were observed by several Los Alamos geosynchronous satellites over a wide range of dayside local times. These bursts exhibited clear time-of-flight dispersion characteristics, enabling the estimation of the burst time, ion species, and source location. In the same time frame, the FAST satellite made numerous passes through the pre-noon sector at low altitudes. For at least 7 consecutive orbits (14 hours) on 31 October and for several orbits on both 29 and 30 October, FAST observed multiple bands in the ion energy spectrum in the region from L 4 to L 12 on the day side. The energy of the bands ranged from 50 eV to 10 keV, and the energy of each band remained fairly constant across the full latitude range of a given pass. Multiple bands were observed in both H+ and O+, and the band energies for the two species were essentially the same. Comparison of the low-altitude banded ions and the simultaneously-observed geosynchronous field-aligned ions provides important constraints on the source mechanism(s) for this significant contribution to the dayside ion population.

SH43A CC: 220 C-E Thursday 1330h

Analysis of the 1859 Carrington Event and Other Major Superstorms I Posters *(joint with SA, SM)*

Presiding: **D F Smart,** Air Force Research Laboratory**; M A Shea,** Air Force Research Laboratory

SH43A-01 1330h POSTER

The Carrington Event: Possible Solar Proton Intensity-Time Profile

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We evaluate the >30 MeV proton fluence associated with the Carrington event as 1.9 x 10**10 protons per sqcm based on the analysis of solar proton generated NO(y) radicals that are deposited in polar ice. (See McCracken et al., JGR, 106, 21,585, 2001.) We construct a possible intensity-time profile of the solar particle flux for this event by assuming that it is part of the class of interplanetary shock dominated events where the maximum particle flux is observed as the shock passes the earth. We show that most of the very large solar proton fluence events (those with >30 MeV omnidirectonal fluence exceeding 1 x 10**9 protons per cmsq) observed at the earth during the last 50 years belong to this class of event.

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