that is in force-balance (and is therefore self-consistent) with the RCM's plasma distribution. Various levels of steady external driving conditions are imposed in order to contrast the ability of the model magnetosphere to respond to differing rates of energy input and form a steady-state convection pattern. Model results will be compared with empirical SMC morphology.

SM22A-0229 1330h POSTER

Modeling System Earth During Geomagnetic Polarity Transitions

Miriam Sinnhuber[1] (miriam@iup.physik.uni-bremen.de); Bertalan Zieger[2] (b.zieger@iu-bremen.de); Joachim Vogt[2] (j.vogt@iu-bremen.de); Anja Stadelmann[3] (a.neuhaus@tu-bs.de); Klaus F. Kuenzi[1] (kunzi@physik.uni-bremen.de); May-Britt Kallenrode[4] (mkallenr@uni-osnabrueck.de); Bernd Heber[4] (bheber@uni-osnabrueck.de); Karl-Heinz Glassmeier[3] (kh.glassmeier@tu-bs.de); John P. Burrows[1] (burrows@iup.physik.uni-bremen.de)

[1]Institute of Environmental Physics, University of Bremen, Otto-Hahn-Alle 1, Bremen D-28359, Germany

[2]International University Bremen, Campus Ring 8, Bremen D-28759, Germany

[3]Institute of Geophysics and Meteorology, Technical University Braunschweig, Mendelsohnstr. 3, Braunschweig D-38106, Germany

[4]University of Osnabrueck, Barbarastr. 7, Osnabrueck D-49069, Germany

During a geomagnetic polarity transition, the configuration and strength of the Earth's geomagnetic field can differ very much from the current state. This has consequences not only for the large-scale current systems, but also for the distribution of high-energy particle precipitation into the middle atmosphere, and therefore, for the composition of the middle atmosphere during and after large energetic particle events. Observations of the Earth's magnetic field during the last century show an increase of variability and a decrease of magnetic field strength. It has been argued that this might imply that a new polarity transition of the Earth's magnetic field is preparing to occur. This work is a multi-institutional collaboration aiming at modeling the magnetosphere during polarity transitions, the resulting energetic particle fluxes, and their effect on the middle atmospheric ozone concentration. We use MHD simulations and parametric modeling of the paleomagnetosphere to determine the geomagnetic field configuration for different transition scenarios. Particle orbits are traced and the resulting particle fluxes are used as input parameters in Monte-Carlo simulations of the mesospheric and stratospheric energy deposition and ionization. The effects on the composition of the middle atmosphere are investigated by means of a two-dimensional photochemistry and transport model. Although these models describe very different physical processes, links can be established through well-defined interfaces, and the chain of models allows us to study the global consequences of geomagnetic field reversals on system Earth.

SM22A-0230 1330h POSTER

Investigation of Shabansky Orbit Accessibility by Using 3D Particle Tracing in the Global MHD Simulations

Xi Shao[1] (3012861847; shao@mail630.gsfc.nasa.gov); Shing F. Fung[1] (fung@astro.umd.edu); Lun C. Tan[1] (ltan@ndadsb-f.gsfc.nasa.gov); K. Papadopoulos[2] (kp@spp.astro.umd.edu); Michael Wiltberger[3] (wiltbemj@ucar.edu); John G. Lyon[4] (lyon@tinman.dartmouth.edu)

[1]NASA Goddard Space Flight Center, Space Physics Data Facility NASA Goddard Space Flight Center, Greenbelt, MD 20771, United States

[2]University of Maryland, Department of Astronomy University of Maryland, College Park, MD 20742, United States

[3]NCAR, NCAR 3450 Mitvhell Ln., Boulder, CO 80301, United States

[4]Dartmouth College, Department of Physics Dartmouth College, Hanover, NH 03755, United States

Due to the existence of the magnetic field strength minimum in the outer cusp region, energetic particles (a few hundred keV protons and MeV electrons) approaching the dayside magnetic field lines with a minimum field off-equator will experience large scale transport toward high latitude, being trapped at high latitude, and then being scattered back through Shabansky orbit [Shabansky, 1971]. The particle trajectories inside the magnetosphere can be grouped into three classes: (a) bouncing around the Equator (trapped); (b) going through Shabansky Orbit or being elevated at dayside (pseudo-trapped); (c) lost. Characterizing these three regions of particles and understanding their dependence on the solar wind condition can help understand the energization and loss of energetic particles in the radiation belt. Recently, we developed a 3D particle tracing code to simulate particle transport in transient global MHD (LFM model) simulation output. The protons are traced with full-motion and electrons are traced with guiding-center approximation. By launching energetic electrons and protons with different pitch angle and from various location along the tail in the model magnetosphere, recording and averaging the latitude the particle experiences at the dayside, we derive the Shabansky Orbit Accessibility Map (SOAMap) to visualize the three regions (trapped, pseudo-trapped, and lost) and their dependence on the initial launching position and pitch angle. We derived the SOAMaps for both electrons and protons inside steady state magnetosphere under different solar wind conditions. We also studied the evolution of the SOAMaps during a simulated magnetospheric substorm triggered by the turning of the solar wind IMF from northward to southward. Combining 3D particle tracing and global MHD simulation provides an integrated view of 3D energetic particle transport inside the Earth's magnetosphere. Shabansky, V. P., Some processes in the magnetosphere, Space Sci. Rev., 12, 299, 1971.

SM22A-0231 1330h POSTER

A Real-time Forecast Model for the Dst Index

Michael Temerin[1] (303-548-9979; temerin@mac.com)

Xinlin Li[2] (303-492-3514; lix@lasp.colorado.edu)

[1]Space Sciences Lab, UC Berkeley, Berkeley, CA 94720, United States

[2]LASP and Dept. of Aerospace Engineering Science of U. of Colorado, 1234 Innovation Drive, Boulder, CO 80303-7814, United States

Since the solar wind controls magnetospheric activity, solar wind measurements upstream of the Earth near the L1 libration point can predict geomagnetic activity about one hour in advance. We have developed a prediction model for the Dst index using the solar wind as the sole input. Our current model is operating in real-time, using real-time solar wind data from ACE, which is positioned around the L1 libration point. The structure of solar wind near the L1 libration point and the evolution of solar wind structures from the libration point to the Earth can degrade such predictions. However, we have found that the lack of accurate solar wind measurements is the most important factor limiting accurate Dst forecasts in real time. During the past year neither the real time ACE measurements or the near real time Dst measurements have been accurate and predictions of Dst have been bad. We will show examples of our real-time forecast and the physical basis of our model and the implication of the results will be discussed.

URL: http://lasp.colorado.edu/∼lix/

SM22A-0232 1330h POSTER

The Thermosphere/Ionosphere (TI) Response to Magnetosphere Energy Inputs

Wenbin Wang[1] (303 497 2177; wbwang@ucar.edu); Michael Wiltberger[1] (wiltbemj@ucar.edu); John G Lyon[2] (lyon@tinman.dartmouth.edu); Alan G Burns[1] (aburns@ucar.edu); Stan Solomon[1] (statn@ucar.edu); Tim L. Killeen[1] (killeen@ucar.edu)

[1]High Altitude Observatory, NCAR, P. O. Box 3000, Boulder, CO 80307

[2]Department of Physics and Astronomy Dartmouth College, 6127 Wilder Laboratory, Hanover, NH 03755

The Thermosphere/Ionosphere Nested Grid (TING) Model has been successfully coupled with the Lyon-Fedder-Mobarry (LFM) global magnetosphere MHD code. This code coupling enables self-consistent studies of the global energy budget of the Ionosphere-Thermosphere-Magnetosphere system to be made. In this paper we will present simulation results of an isolated substorm that occurred on May 20, 1996. It is found that the distribution and magnitude of the high latitude energy deposition in the thermosphere and ionosphere changes greatly when an interactive neutral model is coupled with a magnetospheric model. There is a significant north-south asymmetry in energy flux flowing into the IT system, resulting in hemispheric asymmetries in ionospheric Joule heating and conductivities. It is also found that the global distribution of solar produced ionization plays a significant role in ITM coupling.

SM22A-0233 1330h POSTER

Coupled Model of the Magnetosphere/Ionosphere System

G Joyce[1] (joyce@ppd.nrl.navy.mil)

J D Huba[1] (huba@ppd.nrl.navy.mil)

S Slinker[1] (slinker@ppd.nrl.navy.mil)

J A Fedder[2] (fedder@ppd.nrl.navy.mil)

[1]Naval Research Laboratory, Plasma Physics Division, Washington, DC 20375, United States

[2]LET, Inc., MacArthur Ave., Washington, DC 20012, United States

A major issue in space physics is understanding and quantifying the dynamics of a coupled magnetosphere-ionosphere system. The Naval Research Laboratory is now developing a self-consistent model of the magnetosphere and ionosphere. The two models to be coupled are the LFM magnetosphere model and the SAMI3HL ionosphere model. SAMI3HL is a recently developed high latitude ionosphere model based on the NRL SAMI3 low- to mid-latitude model. SAMI3HL is a fully parallelized 3D ionosphere model that uses a fixed, nonorthogonal grid. The two models will be coupled electrodynamically via the field-aligned currents and the polar cap convection potential. A precipitation model will also be developed to provide a self-consistent ionization source for the high latitude ionosphere model. We will discuss the details of these models, how they will be coupled, and present preliminary results.

Research supported by ONR.

SM22B MCC: Level 1 Tuesday 1330h

Jovian Magnetospheric Environment Science for the Jupiter Icy Moons Orbiter (JIMO) III Posters *(joint with P, SA)*

Presiding: **C Paty,** University of Washington**; R J Walker,** Institute of Geophysics and Planetary Physics, University of California, Los Angeles

SM22B-0234 1330h POSTER

Science and Payload Drivers for the Jupiter Icy Moons Orbiter

Ralph L McNutt (443-778-5435; ralph_mcnutt@jhuapl.edu)

Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD 20723, United States

Primary science goals of a mission to the outer three Galilean satellites include the deduction of internal structure and the possible presence of liquid water beneath the ice crusts of these worlds. A liquid-water mantle can provide an explanation of the magnetic characteristics of these moons and also provide a possible site for biological activity, but major unknowns include the possible extent and composition of a sub-surface brine "sea." Using the power re-sources available on the Jupiter Icy Moons Orbiter (JIMO) spacecraft critical data on all of these topics can be re-turned to Earth. A comprehensive payload that can definitely address these goals requires a radar sounder, laser al-timeter, and a suite of fields and particles instruments. An optimized radar sounder for probing beneath the ice should likely be capable of functioning ∼50 MHz at as high a power level as consistent with JIMO resources. A laser altimeter will have a larger mass-to-power ratio and worse power efficiency than a radar sounder. Mass is driven by the optical receiver and alignment requirements. Supporting instrumentation including a magnetometer (magnetic field in situ), imager ("geology" and ice structures), and spectrometers ("mineralogy") are obvious candi-dates for JIMO. Even more important is the inclusion of particle instruments that can measure pickup elements and their isotopes present in the in-situ plasma due to sputtering from the surface of the moons. Such trace elements and isotopes are important for understanding surface processes and adducing the materials present in the ice and impli-cations for subsurface biological activity. Knowledge of these trace elements is also important to understanding the context of the sounder observations. A "wish list" payload combining state-of-the-art instrumentation would com-prise 19 instruments with a mass of 644 kg and requiring 712 W of power, exclusive of a radar sounder. Addition of a 1-kW radar sounder could bring the mass and power totals to nominal values ∼900

kg and ∼3700 W, respectively. To exploit fully such instrumentation, data rates of greater than megabits per second from Jupiter are required, an additional mass and power driver.

SM22B-0235 1330h POSTER

Magnetospheric Interaction of the Galilean Satellites with Jupiter: Auroral Emissions from the Satellites and their Magnetic Footprints

John T Clarke (617-353-0247; jclarke@bu.edu)

Center for Space Physics Boston University, 725 Commonwealth Ave, Boston, MA 02215, United States

Each of the Galilean satellites of Jupiter has an electrodynamic interaction with Jupiter's magnetic field, due to their motion with respect to the corotating field which sweeps past each satellite. With the exception of Callisto, these interactions can be observed via auroral emissions from the magnetic footprints of each satellite in Jupiter's atmosphere, and also via auroral emissions produced in the satellite's atmosphere. Remote sensing observations from the JIMO spacecraft could provide measurements of these auroral emissions with excellent spatial resolution and time coverage, strongly complementing in situ plasma and field measurements near each satellite. The measurement of the auroral emissions at both ends of the field lines threading each satellite would provide important constraints on the nature and strength of the interaction. Extended time series made possible by remote sensing would reveal the variations of these emissions with the location of each satellite in Jupiter's field and the corotating plasma. The time coverage would also provide a baseline for the interpretation of the in situ measurements, which measure one location at a time. The prospects for this remote sensing by JIMO will be explored based on information from the Hubble Space Telescope measurements of Jupiter's auroral emissions.

SM22B-0236 1330h POSTER

Observation of Jupiter's Polar Cusps

Renée Prangé[1] ((33) 1 4507 7165; renee.prange@obspm.fr)

Laurent Pallier[1] ((33) 1 4507 7699; laurent.pallier@obspm.fr)

[1]LESIA - Observatoire de Paris, 5 place Jules Janssen, Meudon 92195, France

Global analysis of the HST-STIS data from Jovian auroral observations has revealed the presence of a southern equivalent of the northern transient feature referred to as the northern polar cusp or as an 'auroral flare'. In both hemispheres the features are located near the open/closed field line boundary, and their longitudes follow a constant-magnetic-time profile, near noon, while Jupiter rotates. The spot brightness also varies consistently in both hemispheres. We suggest that these spots are indeed at the footprint of the Jovian polar cusps or in its close vicinity, and that their brightenings are indicative of transient reconnection processes with the interplanetary magnetic field (IMF). A STIS spectrum reveals very penetrating primary particles, possibly up to 200 keV "equivalent electron energy". This suggests the existence of a very efficient acceleration mechanism along near-cusp magnetic field lines, or of some sort of mixing with plasma from closed outer magnetosphere field lines, as discussed in the case of the Earth.

SM22B-0237 1330h POSTER

Jovian Cusp Processes: Implications for the Polar Aurora

Emma J Bunce[1] (+44-116-223-1302; emma.bunce@ion.le.ac.uk)

Stanley WH Cowley[1] (+44-116-223-1331; stan.cowley@ion.le.ac.uk)

Timothy K Yeoman[1] (+44-116-252-3564; tim.yeoman@ion.le.ac.uk)

[1]Department of Physics and Astronomy, University of Leicester, Leicester LE1 7RH, United Kingdom

Jupiter's polar emissions, which include all auroral emission lying poleward of the main auroral oval, are ordered by magnetic local time, indicating external control by the solar wind interaction with the jovian magnetosphere. The main auroral oval itself appears fixed with respect to the planet, an indication of planetary control, and is understood to be associated with magnetosphere-ionosphere coupling, and the transfer of angular momentum from the ionosphere to the middle magnetosphere plasma. We have recently considered the flows present in Jupiter's ionosphere in terms of three different regimes: the sub-corotational flows associated with the main auroral oval, the Vasyliunas cycle associated with the down-tail loss of plasmoids (predominantly a feature of the dusk-side magnetosphere), and the Dungey-cycle flows which are associated with the interaction of the solar wind and embedded interplanetary magnetic field with the magnetosphere, principally via reconnection. Motivated by this picture, we consider from a theoretical standpoint what the effects of pulsed dayside magnetic reconnection will be at Jupiter. This will generate a twin-vortical flow pattern in the ionosphere across the open-closed field line boundary, associated with a bi-polar (i.e. upward and downward) field-aligned current pair. These currents will be of order ∼1-2 MA, representing <10% of the magnetopause current, flowing in a region 1000 km across at ionospheric heights, such that the field-aligned current densities peak at ∼1 μA m^{-2}. Here we investigate the conditions under which such currents may be carried in either magnetospheric or cusp plasmas, and consider the consequences for auroral emissions at UV and X-ray wavelengths.

SM22B-0238 1330h POSTER

A Simulation Study of the Response of the Jovian Magnetosphere to Changes in the Solar Wind Dynamic Pressure and Interplanetary Magnetic Field

Raymond J Walker[1] (310-825-7685; rwalker@igpp.ucla.edu)

Tatsuki Ogino[2] (ogino@stelab.nagoya-u.ac.jp)

Keiichiro Fukazawa[2] (fukazawa@stelab.nagoya-u.ac.jp)

[1]Institute of Geophsics and Planetary Physics and Department of Earth and Space Science, University of California, Los Angeles, Los Angeles, CA 90095-1567, United States

[2]Solar Terrestrial Environment Laboratory, Nagoya University 3-13 Honohara, Toyokawa 442-8507, Japan

A rapidly rotating equatorial current sheet and plasma sheet dominates the Jovian magnetosphere. We have used a global magnetohydrodynamic (MHD) simulation to investigate the effects of changes in the solar wind dynamic pressure and interplanetary magnetic field (IMF) on the Jovian magnetospheric configuration with emphasis on changes in the equatorial plasma sheet. We have carried out three numerical experiments: 1. We set the IMF to zero and reduced the solar wind dynamic pressure from 0.09nPa to 0.011nPa in three steps. The bow shock and magnetopause moved away from Jupiter. In the middle magnetosphere near Jupiter the azimuthal velocity increased at all local times with the largest increases in the late afternoon and evening. The radial flow component in the plasma sheet was away from Jupiter in the evening and morning but toward Jupiter in the afternoon. 2. We fixed the solar wind dynamic pressure at 0.011nPa and introduced a northward IMF of 0.105nT into the solar wind. Dayside reconnection started dawnward of noon and was accompanied by duskward propagating oscillations on the magnetopause. The magnetic field and plasma pressure were anticorrelated in the waves suggesting a slow mode structure. The wave generation persisted throughout the 112 hours of the numerical experiment. The dayside reconnection was followed by reconnection in the Jovian magnetotail. Although the IMF was constant the tail reconnection was episodic with 25 to 35 hours between the reconnection intervals. The equatorial plasma sheet and flow pattern were greatly altered by the reconnection especially in the afternoon region of Jupiterward flows. 3. We fixed the solar wind dynamic pressure at 0.011nPa and introduced a southward IMF into the solar wind. For southward IMF reconnection occurred at high latitudes in the polar cusp and the bow shock and magnetopause moved away from Jupiter. The equatorial plasma sheet and flows became more axisymmetric.

SM22B-0239 1330h POSTER

Do the Jovian Bow Shock and Magnetopause Surfaces in the Joy et al. (2002) Model Predict Measured Boundary Normals Correctly?

Steven P Joy[1,2] ((310) 825-3506; sjoy@igpp.ucla.edu)

William S Kurth[3] (william-kurth@uiowa.edu)

Margaret G Kivelson[1,2] (mkivelson@igpp.ucla.edu)

Raymond J Walker[1,2] (rwalker@igpp.ucla.edu)

[1]UCLA Institute of Geophysics and Space Physics, 405 Hilgard Ave, Los Angeles, CA 90095-1567, United States

[2]UCLA Dept. of Earth and Space Science, 405 Hilgard Ave, Los Angeles, CA 90095-1567, United States

[3]University of Iowa, Dept. of Physics and Astronomy, Iowa City, IA 52242-1479, United States

Joy et al. (2002) provided probabilistic descriptions of the jovian bow shock and magnetopause by mapping spacecraft observations to the sub-solar point along model surfaces derived from the MHD simulation of Ogino et al. (1998). The resulting statistics are strongly affected by the surface models used in the mapping process. Here we analyze the quality of the surface models used in that mapping by comparing the normal directions of the observed boundary crossings to the normal directions predicted by the surface models. We have identified 116 magnetopause and 74 bow shock crossings in the Galileo data from orbits 0 through 34 using both the plasma wave (PWS) and magnetometer (MAG) data sets. We have determined the boundary normal directions for both these newly identified crossings and the previously published crossings of Galileo, Ulysses, Voyagers 1 and 2, and Pioneers 10 and 11. When possible, boundary normals were determined from the MAG data by using the minimum variance technique of Sonnerup and Cahill. Some boundary crossings could not be analyzed because of data gaps or inadequate sampling resolution. The boundary crossings are well distributed in local time (∼03:00 to 19:00) and are mostly near equatorial. Initial results indicate that the shape models used by Joy et al. (2002) are reasonable. We will examine the small non-zero mean difference between the observed and model boundary normal directions to determine whether the discrepancy is statistically significant. The large variance of the normal direction about the mean may imply that the normal directions fluctuate because of surface waves on the boundaries or that steady-state surface models do not apply in the presence of changing solar wind conditions.

SM22B-0240 1330h POSTER

The Response of the Jovian Magnetosphere to Rapid Changes in Solar Wind Dynamic Pressure

Kenneth C Hansen[1] (kenhan@umich.edu)

Tamas I Gombosi[1] (tamas@umich.edu)

Aaron J Ridley[1] (ridley@umich.edu)

Darren L De Zeeuw[1] (darrens@umich.edu)

[1]Center for Space Environment Modeling, University of Michigan, Space Research Building, Ann Arbor, MI 48109, United States

Recently several papers have been published about the role of solar wind forcing in Jupiter's magnetosphere. These works, based on Galileo magnetic field data, Cassini RPWS data or on theoretical exercises, have improved our understanding of the Jovian magnetosphere. However, there are contradictions between some of the theories and the data, possibly due to the single point nature of the measurements and especially due to the lack of an upstream monitor to measure solar wind conditions. These two issues make determining the cause or driver of an event difficult. Using our global MHD model of the Jovian magnetosphere, we investigate the response of the Jovian magnetosphere to rapid changes in the solar wind dynamic pressure. Since in the model we can tightly control the solar wind input, we are able to isolate cause and effect. These simulations concentrate on compression and expansion events present in the solar wind. We will present the results of idealized cases as well as cases taken from "real" solar wind conditions obtained by propagating the solar wind outward from the Earth. We will analyze the global response of the magnetosphere-ionosphere system by examining magnetospheric changes such as: changes in the magnetic field magnitude, in the magnetic field lead/lag angles and in the plasma density and velocity. In addition, with our coupled magnetosphere-ionosphere model we examine the field aligned currents (FAC) and the auroral convection and potential.

SM22B-0241 1330h POSTER

Structure of the Jovian magnetosphere as Determined by 3-D Multi-Fluid Simulations

Laurel Rachmeler[1] (lrachmel@u.washington.edu)

Robert M Winglee[1] (winglee@ess.washington.edu)

Carol Paty[1] (cpaty@u.washington.edu)

Erika Harnett[1] (eharnett@ess.washington.edu)

[1]Univ. of Washington, Dept. of Earth and Space Sciences, Seattle, WA 98195-1310, United States

The Jovian magnetosphere is highly structured due to the presence of different sources of plasma within it. These sources include light ions from the Jovian ionosphere, sulfur and oxygen ions from Io and the Io plasma torus and hydrogen and oxygen sputtered from the other Galilean moons. These different sources are modeled by high-resolution 3-d multi-fluid simulations

that are able to determine the individual contributions from the different ion species. The simulations have an inner radius 2 R_J and extended out to several hundred R_J down the tail. We show that the size of the Jovian magnetosphere is dependent on the magnitude of the Jovian ionospheric outflow rate, and this outflow produces mass loading of the magnetosphere out to large distances. The Io torus is shown to be very stable and that other means of perturbing it such as from Io itself is needed to enhance its possible outward. At radial distances near the outer Galilean moons, the story is very much different as the magnetosphere undergoes a transition from a corotational regime to a non-corotational region. In this case, convection of plasma allows it to move further out into the magnetosphere to cause additional dragging of field lines. This transition in the convection pattern of plasma is seen in association with the strong warping of the magnetic field at the outer Galilean moons.

SM22B-0242 1330h POSTER

The Local Time Variation of the Structure of Jupiter's Magnetosphere: Inferences for Plasma Loss

Margaret G. Kivelson[1] ((310) 825-3435; mkivelson@igpp.ucla.edu)

David J. Southwood[2] (022-33-1-53-69-71-70; david.southwood@esa.int)

[1]UCLA/IGPP, 6843 Slichter Hall, 405 Hilgard Ave., Los Angeles, CA 90095-1567, United States

[2]ESA Headquarters, 8-10 rue Mario-Nikis, F-75738, Paris Cedex 15, France

Exploiting the capability given by the magnetometer data set from the entire Galileo mission as well as previous data from spacecraft flybys, we survey the local time structure of Jupiter's magnetosphere. We pay particular attention to the current sheet and regions beyond. The sheet is thinnest in the morning hours; it can thicken by more than a factor of 10 during the rotation to dusk. At the same time, the distinctive outer magnetospheric region typically present beyond the edge of the sheet in the morning side and often pervaded by field nulls is also less clear by late afternoon. The magnetodisk appears to remain thick in the pre-midnight hours and to thin increasingly as it rotates past midnight towards the dawn flank. Using the appearance of brief bursts of northward field in the sheet as a proxy for the occurrence of reconnection, we note that such signatures appear more often and closer to Jupiter the closer one moves across the nightside towards dawn. As contrasted with Earth's magnetotail in which dynamic reconnection is followed by a significant change of field configuration, Jupiter's magnetotail field remains highly distended following the bursts of activity and gives little evidence for sustained reconnection anywhere inside the region surveyed by Galileo. We conclude that the data best fit with a pattern of plasma and flux circulation in the magnetosphere wherein a large fraction of the magnetodisk plasma is lost in each planetary rotation and where morning-afternoon asymmetries as well as day-night asymmetries in dynamics are fundamental.

SM22B-0243 1330h POSTER

Plasma Sheet Thickness at Jupiter From Galileo Electron Density Measurements

Jay A Ansher[1] ((309) 438-7009; ansher@phy.ilstu.edu)

Donald A Gurnett[2] (donald-gurnett@uiowa.edu)

Daniel L Holland[1] (holland@phy.ilstu.edu)

Richard F Martin[1] (rfm@phy.ilstu.edu)

[1]Illinois State University, Department of Physics Campus Box 4560, Normal, IL 61790-4560, United States

[2]University of Iowa, Department of Physics Van Allen Hall, Iowa City, IA 52242, United States

Electron density has been determined throughout much of the Galileo primary mission at Jupiter (December 7, 1995 to November 6, 1997) by observing plasma waves measured by the plasma wave instrument on board the spacecraft. The density data set is used here to identify spacecraft encounters with Jupiter's magnetotail plasma sheet during the primary mission by assuming that electron density is highest at the center of the plasma sheet. As Jupiter rotates, the spacecraft encounters one pair of plasma sheet crossings during each ten-hour rotation period. Electron density is usually seen to increase as Galileo enters the plasma sheet, reach a maximum value near the center of the plasma sheet, and then decrease as the spacecraft exits the plasma sheet. This signature is clearest in the data at radial distances between 20 RJ, and 50 RJ from Jupiter. Plasma sheet thickness is determined by identifying the z-coordinate of the spacecraft as it enters and exits the plasma sheet. This z-coordinate can be measured with respect to a number of different coordinate systems and magnetic field models. Through analysis of plasma sheet thickness in Jupiter's magnetotail, we observe a thicker plasma sheet in the midnight and dusk sectors and a thinner, more distinct sheet in Jupiter's dawn sector. These observations are consistent with magnetic field signatures reported by the Galileo magnetometer team.

SM22B-0244 1330h POSTER

3D Multi-fluid Simulations of Ganymede's Magnetosphere

Carol Paty[1] (206-685-3470; carol@ess.washington.edu)

Robert M Winglee[1] (winglee@ess.washington.edu)

Erika Harnett[1] (eharnett@ess.washington.edu)

[1]University of Washington Earth and Space Sciences, Box 351310, Seattle, WA 98195-1310, United States

The location of Ganymede and its magnetosphere well inside the Jovian magnetosphere provides a unique case study for magnetosphere and ionosphere coupled interactions between this satellite and Jupiter. Auroral expressions of this coupling have been observed at both Jupiter and Ganymede by the Space Telescope imaging spectrograph on HST. The parameter space surrounding Ganymede is also unique in the solar system in that it provides the only example of a magnetosphere in a nearly sonic and Alfvenic flow region where there is continuous reconnection driving storm-like processes. A preliminary study was performed using 3D multi-fluid simulations that examine the range of possible Alfven and sonic mach number flows and their effect on Ganymede's magnetosphere and weak ionosphere. Value ranges for these flows were determined from plasma and magnetic field measurements made by the Galileo satellite and from Jovian global simulations. These simulations show a highly warped magnetopause where the location on the flanks is consistent with measurements and theory extrapolated from the Galileo flybys. The simulations show differential acceleration of the heavy Ganymede ions with respect to the lighter Jovian magnetospheric population. Ion cyclotron effects produce substantial asymmetries in the Ganymede magnetosphere which effect the location of the tail neutral line and overall shape of the magnetosphere.

SM22B-0245 1330h POSTER

On the Possibility of Detection of Electromagnetic Induction in Titan's Interior

Jared S Leisner[1] (jleisner@ess.ucla.edu)

Gerald Schubert[1] (schubert@ucla.edu)

Krishan K Khurana[2] (kkhurana@igpp.ucla.edu)

Christopher T Russell[1,2] (ctrussell@igpp.ucla.edu)

[1]Department of Earth and Space Sciences, University of California–Los Angeles, Los Angeles, CA 90095-1567, United States

[2]Institute of Geophysics and Planetary Physics, University of California–Los Angeles, Los Angeles, CA 90095-1567, United States

Electromagnetic induction has been found to occur in Europa and Callisto and has led to the discovery of subsurface liquid water oceans in these bodies. It is possible that this phenomenon has been detected in Ganymede, which may also have an internal ocean. In this presentation, we explore the possibility that electromagnetic induction might occur in Titan and be detectable by the Cassini magnetometer. As Titan orbits Saturn, it experiences two types of changes in the local magnetic field strength: the first is due to Titan's orbital motion within Saturn's magnetosphere, which imposes a periodic total variation of magnitude 4 nT at Titan's orbital frequency; and the second is an abrupt change of 6 nT when Titan crosses Saturn's magnetopause, which occurs when the solar wind pressure is great enough that Saturn's magnetopause is pushed within Titan's orbit. We investigate the magnetic field that may be induced due to these variations by modelling Titan as a non-conducting sphere with an embedded conducting layer. We evaluate the Cassini trajectories in order to estimate the possibility of observing an induced field during the Titan flybys.

SM22B-0246 1330h POSTER

Science Opportunities with a Double-Langmuir Probe Experiment for the Jupiter Icy Moons Orbiter

Jan-Erik Wahlund[1] (+46-18-471-5946; jwe@irfu.se); L. G. Blomberg[2] (Lars.Blomberg@alfvenlab.kth.se); M. Andre[1] (ma@irfu.se); M. Morooka[1] (michiko@irfu.se); J. A. Cumnock[2] (l.g.blomberg@telia.com); W. S. Kurth[3] (william-kurth@uiowa.edu); D. A. Gurnett[3] (donald-gurnett@uiowa.edu); S. D. Bale[4] (bale@ssl.berkeley.edu)

[1]Swedish Institute of Space Physics, Angströmlaboratoriet, Uppsala SE-751 21, Sweden

[2]Alfven Laboratory, KTH, Stockholm SE-100 44, Sweden

[3]Iowa University, Dept. of Physics and Astronomy, Iowa City IA 52242, United States

[4]Space Science Laboratory, UC Berkeley, Berkeley CA, United States

The three icy Galilean moons of Jupiter, Callisto, Ganymede, and Europa, offer a range of exciting science opportunities for space physics and aeronomy. All three moons have thin atmospheres of mostly molecular oxygen probably arising from magnetospheric ion bombardement sputtering of their water-ice surfaces. The atmospheres and their ionized ionospheric components interact strongly with the co-rotating magnetosphere of Jupiter. The residence times for their atmospheres are of the order of a few days at most. The estimated peak electron densities varies between 1,000-10,000 cm(-3) near their surfaces, and the ionosphere of Callisto seems highly variable in time. A particularly interesting interaction occurs between the magnetosphere of Jupiter and the mini-magnetosphere of Ganymede and its ionosphere. The surface-interactions with the space environment determine the atmospheric and ionospheric properties (e.g., density, composition, and temperature), which offer an opportunity to investigate the weathering properties of the surface. It has been suggested that at least Europa has significant amounts of ocean material expelled into its atmosphere. A double-Langmuir probe (LP) experiment orbiting the moons at a short distance for several months would give valuable insight into many of the processes mentioned above. The LP would measure in-situ plasma density and temperatures of the ionospheric components of the moons with high time resolution and thereby determine the dynamical behaviour of surface weathering and magnetospheric influences. Moreover, LP voltage sweeps would also give information on the Ly-alpha UV intensity and micrometer dust impacts, both important parameters for determining the surface-space interaction processes. By making use of two LP sensors the plasma flow and dc electric field components can be estimated. These are important for determining the detailed dynamics of the interaction of Jupiter's magnetosphere with its moons. The instrument proposed has heritage from the Rosetta LAP instrument, the Cassini RPWS Langmuir Probe, as well as the Cluster EFW plasma wave experiment.

SM22B-0247 1330h POSTER

The Ionosphere and Plumes of Europa

Aharon Eviatar[1] (97236406077; arkee@daphne.tau.ac.il)

Chris Paranicas[2] (240-228-8652; Chris.Paranicas@jhuapl.edu)

[1]Tel Aviv University , Ramat Aviv , Tel Aviv 69978, Israel

[2]Applied Physics Laboratory Johns Hopkins University, Johns Hopkins Road, Laurel, MD 20723, United States

We investigate the proposition that Europa emits a plasma plume, *i.e* a contiguous body of ionospheric plasma, extended in the direction of the coroation flow, analgous to the plume of smoke emitted in downwind direction from a smokestack. Such plumes were seen by *Voyager* 1 to be emitted by Titan. We find support for this proposition in published data from *Galileo* Plasma Science and Plasma Wave observations taken in the corotation wake of Europa and from magnetometer measurements reported from near the orbit, but away from Europa itself. This lends credence to the hypothesis that the plumes escaping from the ionosphere of Europa are wrapped around Jupiter by corotation, survive against dispersion for a fairly long time and are convected radially by magnetospheric motions. We present simple models of ionosphere aeronomy and plume acceleration and conclude that the plumes must consist of atomic oxygen ions flowing out, as observed, at subcorotational speed.

SM22B-0248 1330h POSTER

Supply of trans-Europa Neutral Torus by the Surface-bounded Atmosphere of Europa

Valery Shematovich[1] (shematov@inasan.rssi.ru)

Robert E Johnson[2] (434-924-7237; rej@virginia.edu)

John F Cooper[3] (jfcooper@pop600.gsfc.nasa.gov)

Mau C Wong[4] (mauwong@jpl.nasa.gov)

[1]Institute of Astronomy RAS, 48 Pyatnitskaya str., Moscow 119017, Russian Federation

[2]Engineering Physics and Astronomy Department, Thornton Hall B103 University of Virginia, Charlottesdville, VA 22904, United States

[3]Raytheon Technical Services Company, SSDOO Project, Space Physics Data Facility, Code 632, NASA Goddard Space Flight Center, Greenbelt, MD 20771

[4]Jet Propulsion Laboratory, Californiz Institute of Technology, Pasedena, CA 91109, United States

Magnetospheric ion sputtering is an important source of neutrals at the icy Galilean satellites [1-3]. The Cassini Magnetosphere Imaging Instrument (MIMI) has detected [4] a neutral cloud located at Europa's orbit and likely consisting of sputtering products. A collisional Monte Carlo model of Europa's surface-bounded atmosphere in which the thermal and sputtering sources of H2O molecules and their molecular fragments are accounted for was developed [5]. Dissociation and ionization of H2O and O2 by magnetospheric electrons, solar UV radiation and photoelectron impact, and collisional ejection from the atmosphere by the low energy plasma are taken into account. The surface-bounded O2 atmosphere of Europa originates from a balance between radiolysis of the satellite icy surface by the solar UV radiation and high-energy magnetospheric plasma and the collisional ejection from the surface-bounded atmosphere by the low-energy plasma. The enhanced oxygen production rate found earlier [6] is used along with comparable H2O ejection rate. Calculations show that the atmospheric chemical composition is determined by both the water and oxygen photochemistry in the near-surface atmospheric region, escape of suprathermal neutrals into the Jovian system, and the adsorption-desorption exchange by radiolytic water products with the satellite surface. It is shown, as was the case for the sodium atmosphere [7], that the oxygen and hydrogen loss from Europa's atmosphere supplies its gas torus [8]. The calculated oxygen supply rates are in the range (6-10)$\times 10^{27}$ atoms per second depending on the ratio of thermal (evaporation) and nonthermal (sputtering) source rates. Using an oxygen ionization rate of 2.0×10^{-6} s^{-1} the estimate of the total number N of neutrals in the torus is (3.0 - 5.0)$\times 10^{33}$ O atoms. This should be doubled to take into account the escape of atomic and molecular hydrogen. This eatimate approaches that inferred from observations [4] (4.5 - 9.0)$\times 10^{33}$ atoms. Therefore, the collisional Monte Carlo model of Europa's surface-bounded atmosphere may be able to provide the required supply of neutrals to the trans-Europa gas torus in the inner Jupiter's magnetosphere.

[1] Johnson, R.E., et al. 1998. Europa's Surface and Sputter-Produced Ionosphere. GRL 25, 3257-3260. [2] Cooper, J.F.,et al.2001. Energetic Ion and Electron Irradiation of the Icy Galilean Satellites. Icarus 149, 133-159. [3] Johnson, R.E., et al. 2003. Radiation Effects on the Surface of the Galilean Satellites, ed. F. Bagenal, Jupiter: Planet, Satellites & Magnetosphere, Cambridge University Press, Cambridge, in press. [4] Mauk B. H., et al. 2003. Energetic neutral atoms from a trans-Europa gas torus at Jupiter, Nature 421, 920-922. [5] Shematovich, V.I., R.E. Johnson, and J.F. Cooper 2003. Surface-bounded Oxygen Atmosphere of Europa. EGS-AGU-EGU Joint Assembly, abstract 13094, Nice, France. [6] Shematovich, V.I. and R.E. Johnson 2001. Near-Surface Oxygen Atmosphere at Europa. Adv. Space Res. 27, 1881-1888. [7] Leblanc, F., R.E. Johnson and M.E. Brown 2002. Europa's Sodium Atmosphere: an Ocean Source? Icarus 159, 132-144. [8] Eviatar, A., A. Bar-Nun, and M. Podolak 1985. Europan surface phenomena. Icarus 61, 185-191.

SM22B-0249 1330h POSTER

Energetic Particles as Probes of Magnetic Environments for Galilean Moons at Jupiter

John F. Cooper (301-286-1193; jfcooper@pop600.gsfc.nasa.gov)

Raytheon Technical Services Company, SSDOO Project, Code 632, NASA Goddard Space Flight Center, Greenbelt, MD 20771, United States

Perhaps the most exciting discovery from Galileo Orbiter multiple flybys of Galilean moons has been presence of permanent (Ganymede) and induced (Europa, Ganymede, and Callisto) dipole moments from magnetometer data. Two polar flybys of Io ruled out a permanent dipole but the complex plasma environment has made determinations for an induced dipole, e.g. from a magma ocean, more elusive. However, a magnetometer can only measure local field vectors and magnitude at the spacecraft, not global field line configuration around a moon. The initial discovery of the Ganymede dipole in the magnetometer data was, however, complemented by detection of surface loss cones, consistent with dipole field geometry, in magnetic pitch angle distributions of energetic particles measured by the Energetic Particles Detector (EPD). It is of historic interest to note that Voyager 2 discoveries of the large tilts of planetary dipoles by magnetometer observations at Uranus and Neptune were also quickly confirmed by energetic particle measurements. This is because trapped energetic particles have predictable motions in smoothly varying magnetic fields, so precise predictions from magnetic field models can be made about positions of intensity and anisotropy variations due to moon interactions. In the Voyager data at Uranus and Neptune the moon sweeping signatures increased in depth at MeV energies for electrons and ions. Due to large gyroradii of high energy heavy ions, the Heavy Ion Counter (HIC) intensities of these iogenic ions at MeV/nucleon energies showed strongly anisotropic intensity variations, due to surface absorption, during many Galileo flybys of Io and Europa. Analysis of the HIC flyby data continues but lack of a permanent dipole at Io is consistent with the equatorial flyby observations. At Europa the HIC results to date indicate strong sensitivity to the induced dipole. Value of energetic ion anisotropy measurements for the moon magnetic environments could be enormously improved by increased energy, mass, and angular resolution at keV to MeV energies covered by EPD and at MeV/nucleon energies covered by HIC. These resolution increases, also allowing isotopic measurements of ions for composition objectives, could be enabled by substantially greater power, data rate, instrument mass, and near-moon observation times to be provided by the Jupiter Icy Moons Orbiter (JIMO) mission. Improved energy and directional resolution for energetic electrons above 10 keV to tens of MeV are also needed to model global distributions of incidence through magnetic environments onto the moon surfaces for computation of depth-dependent radiation dosages relevant to surface chemistry and for astrobiology applications. The latter include production rates to meter depths in the icy regoliths for oxidants and other chemical resources for life in the putative subsurface oceans, assuming efficient geologic transport downward through the overlying ice crust at least for Europa, and destruction rates to the same depths for biochemical signatures of life that may be found on the moon surfaces by remote and in-situ measurements. Our ability to resolve the potential oceanic abode of life within Europa, and to confirm the presence of oceans within Ganymede, Callisto, and perhaps (extended mission?) Io, should vastly improve from measurements provided by energetic particles as complementary to those from magnetic fields, orbital gravimetric analysis, laser/radar altimetry, and the newer techniques for planetary missions of active radio sounding for ionospheric imaging, local magnetic field line tracing via guided echoes, and determination of subsurface stratigraphy.

SM22B-0250 1330h POSTER

Applications of High Etendue Line-Profile Spectroscopy and Spectro-Polarimetry to the Study of the Atmospheric and Magnetospheric Environments of the Jovian Icy Moons.

Walter Harris[1] (wharris@sal.wisc.edu); Fred Roesler[2] (roesler@wisp.physics.wisc.edu); John Harlander[3] (jmharlander@stcloudstate.edu); Ronald Oliversen[4] (ron@midnight.gsfc.nasa.gov); Edwin Mierkiewicz[2] (emierk@wisp.physics.wisc.edu); Gilda Ballester[5] (gilda@vega.lpl.arizona.edu); Jeffrey Morgenthaler[4] (jpmorgen@midnight.gsfc.nasa.gov); Jason Corliss[2] (corliss@wisp.physics.wisc.edu)

[1]University of Washington, Dept. of Earth and Space Sciences 360 Johnson Hall, Seattle, WA 90195

[2]University of Wisconsin, Dept. of Physics 1150 University Ave., Madison, WI 53706

[3]St. Cloud State University, Dept. of Physics 145 Math and Science Bldg., St. Cloud, MN 56301

[4]Goddard Space Flight Center, Lab. for Astro. & Solar Phys. Code 681, Greenbelt, MD 20771

[5]University of Arizona, Lunar and Planetary Laboratory 1040 E. 4th. St, Tucson, AZ 85721

Conditions in the close vicinity of the Jovian icy moons are determined by a complex mix of processes beginning with the production of a tenuous atmosphere from sputtering, evaporative, and possibly tectonic/volcanic sources, extending outward to an exosphere that interacts with ions and neutrals trapped in the massive Jovian magnetosphere. This environment can be very dynamic and strongly dependent on external factors including the density and energy distribution of plasma and neutrals in the jovian corona and that nature of the connection of the jovian magnetosphere to Jupiter and the external solar environment. An understanding of this environment requires specific knowledge of the brightness, distribution and dynamics of all of the different system elements. For the JIMO mission, a UV spatial heterodyne spectroscometer (UVSHS) instrument would provide a degree of sensitivity to atmospheric and coronal emissions that has previously been unobtainable from remote spacecraft where the mass and volume budgets are too limited to support large telescopes. We present here an initial design for a JIMO includes a three channel instrument at the focal plane of a small 20 cm aperture telescope-polarimeter combination that targets FUV emissions from satellite atmospheres, the jovian coronal and Jupiter's airglow and aurora. Because these features are spatially extended from the vantage point of the JIMO instrument and require both high etendue (due to their low surface brightness or the need for photometric precision in polarimetry) and high spectral resolution (to map velocities in the 1-10 km/sec range) to study in detail, the SHS technique is ideally suited to study them.

SM22B-0251 1330h POSTER

Particle Simulations of the Io Inner Torus Boundary

Misa M Cowee[1] (mcowee@igpp.ucla.edu)

Yong Li Wang[1] (ylwang@igpp.ucla.edu)

Christopher T Russell[1] (ctrussel@igpp.ucla.edu)

Donald A Gurnett[2] (dag@space.physics.uiowa.edu)

[1]Institute of Geophysics and Planetary Physics, University of California, Los Angeles, Los Angeles, CA 90095

[2]Department of Physics and Astronomy, University of Iowa, Iowa City, IA 52242

The Galileo spacecraft passed inside the orbit of Io during the A34 pass in November 2002, detecting a sharp inner boundary to the Io plasma torus. This boundary sits at a jovicentric distance between 4.5 and 5 Rj. A model of torus formation utilizing the neutralization and reionization of mass loaded ions from the Io atmosphere predicts an inner torus boundary which depends on the torus flow velocity in the pickup region. If the ion is picked up in the full corotational regime, the associated fast neutrals can move to within 3.5 Rj. However, if the ion is picked up in a flow regime decelerated by only 15 km/s, the fast neutrals reach only to about 4.7 Rj. Thus small variations in the Io-torus interaction region can move the inner edge of the torus. In the model the density dropoff across the boundary is not steep as was observed by Galileo. It is possible that the outward radial transport of the cold torus ions via flux tubes moves the inner boundary and changes the radial density profile of the torus. We add such transport to our model to investigate this possibility.

SM22B-0252 1330h POSTER

Statistics of Depleted Flux Tubes in the Jovian Magnetosphere

Christopher T. Russell[1] (310-825-3188; ctrussell@igpp.ucla.edu)

Margaret G. Kivelson[1] (310-825-3435; mkivelson@igpp.ucla.edu)

Krishan K. Khurana[1] (310-825-8240; kkhurana@igpp.ucla.edu)

[1]University of California Los Angeles, Institute of Geophysics and Planetary Physics, 405 Hilgard Avenue, Los Angeles, CA 90095-1567, United States

On many of its passes through the Io torus the Galileo spacecraft has detected the presence of thin magnetic flux tubes with fields somewhat higher than their surroundings. In these tubes the magnetic pressure is higher than in neighboring tubes to such an extent that it is possible that the plasma contribution to the pressure is insignificant. These tubes occupy 0.32% of the torus outside of the orbit of Io. None are found inside. Their strength indicates that the ratio of the thermal pressure to magnetic pressure in the outer torus is about 2%. Comparison of the observed electron density in the neighborhood of these tubes indicates that the ion temperature is in the range 30-100 eV, consistent with other estimates. The amount of magnetic flux transported by these thin tubes could supply the amount of magnetic flux mass-loaded and transported to the magnetotail if the inward velocity is about 300 times that of the outward transport. Finally, the thin flux tubes are found in clusters as if they would occur if they resulted from the breakup of larger flux tubes.

SM22B-0253 1330h POSTER

Whistler-Mode Resonance-Cone Emissions Generated by Jupiter's Moon Io

L. Xin[1] (lei-xin@uiowa.edu)

D. A. Gurnett[1] (donald-gurnett@uiowa.edu)

M. G. Kivelson[2] (mkivelson@igpp.ucla.edu)

[1]University of Iowa, Dept. of Physics & Astronomy, Iowa City, IA 52242, United States

[2]UCLA, Inst. of Geophysics & Planetary Physics, Los Angeles, CA 90095, United States

During the Galileo flyby of Jupiter's moon, Io, that occurred on October 6, 2001, a well-defined electric field emission was detected by the plasma wave instrument as the spacecraft approached the moon. The spectral characteristics of this emission are very similar to a type of whistler-mode emission called 'auroral hiss' that is commonly observed in the Earth's auroral region. This paper gives a detailed analysis of the 'auroral hiss' observed near Io. The electric field spectrum of the auroral hiss emission observed near Io has a sharp high-frequency cutoff at the electron cyclotron frequency and a funnel-shaped low-frequency cutoff similar to terrestrial auroral hiss. Strong magnetic field perturbations associated with the moon occur near the onset of the electric field noise. We propose that the observed emission is generated by an electron beam in a nearly field-aligned current sheet induced by the interaction of Io with the magnetic field of Jupiter. Using a ray-tracing analysis the position of the emission source is located assuming that the radiation source has either a point- or sheet-like geometry. The ray tracing analysis shows that the whistler-mode radiation originates very close to Io, at an altitude of about 0.15 R_{Io}.

SM22B-0254 1330h POSTER

Excitation of whistler-mode waves and resonant electron scattering in the Jovian magnetosphere

Bidushi Bhattacharya[1] (626 395-4060; bhattach@ipac.caltech.edu)

Richard M Thorne[2] (310-825-5974; rmt@atmos.ucla.edu)

William S. Kurth[3] (william-kurth@uiowa.edu)

Donald A. Gurnett[3] (dag@space.physics.uiowa.edu)

Donald J Williams[4] (Don.Williams@jhuapl.edu)

[1]SIRTF Science Center, MS 220-6 1200 E. California Blvd, Pasadena, CA 91125, United States

[2]Dept. Atmos. Sciences, UCLA, 7127 MS, Box 951565 405 Hilgard Avenue, Los Angeles, CA 90095, United States

[3]Dept. Physics & Astronomy, Univ. of Iowa, 203 Van Allen Hall, Iowa City, IA 52242-1479, United States

[4]Applied Physics Lab, JHU, 11100 Johns Hopkins Road, Laurel, MD 20723-6099, United States

In-situ measurements from the Galileo spacecraft suggest that there is a direct association between enhanced electron fluxes and the presence of whistler-mode plasma waves. A detailed study is presented of a magnetospheric injection event that occurred on day 257 of 1999 at 7.6 R_J using concurrent measurements from the Galileo Energetic Particle Detector (EPD) and Plasma Wave Subsystem (PWS). Simultaneous enhancements are seen in both electron flux and plasma wave power spectral density. Electrons in the energy range 15keV to several hundred keV are enhanced by up to a factor of six over a of nine minute interval. During this period, the plasma waves in the frequency range of a few kHz appear to intensify by factor of up to 10^2 V^2 m^{-2} Hz^{-1}. The source for these waves may be the free energy associated with anisotropic distributions of injected electrons. At this radial distance, we find that B' $\sim$ 100 pT, which is sufficient for strong diffusion scattering. Pitch-angle distributions during the injection provide additional evidence of strong pitch-angle scattering, which may provide the mechanism for appreciable filling the atmospheric loss cone, leading to Jupiter's diffuse aurora.

SM22B-0255 1330h POSTER

Results from the Galileo Energetic Particle Detector during Amalthea Flyby on November 5, 2002

Thomas P Armstrong[1] (785 840 0800; armstrong@ftecs.com)

Lucas Miller[1] (785 840 0800; lmiller@math.ku.edu)

Scott Wadley[1] (785 840 0800; swadley@ftecs.com)

Richard McEntire[2] (240 228 5410; richard,mcentire@jhuapl.edu)

Donald Williams[2] (240 228 5405; donald.williams@jhuapl.edu)

[1]Fundamental Technologies, LLC, 2411 Ponderosa Drive Suite A, Lawrence, Ks 66046, United States

[2]Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Rd, Laurel, Md 20723, United States

The Galileo orbiter recorded the responses of EPD instrument to electrons and protons for about 4 hours prior to and about 20 minutes following its closest approach to Amalthea on orbit 34 at 6:18 SCET on November 5. Energetic electrons penetrating the passive shielding of the EPD sensors complicated the identification and interpretation of responses. However, some facts are clear: a.) there is a significant absorption of 1 to 10 MeV electrons evident in the approximate drift shell of Amalthea; b.) 1 to 2 MeV protons show only a small or possibly non-existent absorption feature in the drift shell; c.) there may be absorption of protons below 1 MeV based on the time-of-flight channels showing a feature which will need further analysis to account for rate-dependent effects. We will evaluate and report on the effective loss and transport rates for electrons and protons at Amalthea.

SM22B-0256 1330h POSTER

Radio Emission Direction Finding During the Galileo Almathea-34 Flyby

J. D. Menietti[1] (319-335-1919; jdm@space.physics.uiowa.edu)

W. S. Kurth[1] (319-335-1962; william-kurth@uiowa.edu)

D. A. Gurnett[1] (319-335-1697; donald-gurnett@uiowa.edu)

J. B. Groene[1] (319-335-1960; joseph-groene@uiowa.edu)

[1]The University of Iowa, Department of Physics and Astronomy, Iowa City, IA 52242, United States

The Galileo spacecraft observed distinct spin modulation of plasma wave emissions during the flyby of Almathea (A34). The modulations occurred in the frequency range from a few hundred hertz to a few hundred kilohertz and probably include at least two distinct wave modes. Assuming transverse EM radiation, we have used the swept-frequency receivers of the electric dipole antenna to determine the direction to the source of these emissions. Additionally, with knowledge of the magnetic field some constraints are placed on the wave mode of the emission based on a comparative analysis of the wave power versus spin phase of the different emissions. The results are helpful in understanding the overall physics of this interesting encounter with the Jovian inner magnetosphere.

SM22C MCC: 2008 Tuesday 1340h

Dynamic Aurora: The Role of Alfvén Waves in I-M Coupling III *(joint with SA, AE)*

Presiding: **C A Kletzing,** University of Iowa**; D J Knudsen,** University of Calgary

SM22C-01 1340h

The role of Alfvénic turbulence in Jupiter's M-I coupling

Joachim Saur[1] (Joachim.Saur@jhuapl.edu)

Annick Pouquet[2] (pouquet@ucar.edu)

William H Matthaeus[3] (yswhm@bartol.udel.edu)

[1]Johns Hopkins University, APL, 11100 Johns Hopkins Rd, Laurel, MD 20723, United States

[2]NCAR, P.O. Box 3000, Boulder, CO 80307, United States

[3]Bartol, Research Institute, 217 Sharp Lab, Newark, DE 19716, United States

In our presentation we will discuss the role of Alfvén waves in Jupiter's M-I coupling and their connection to Jupiter's powerful auroral oval, with an emitted UV power about three orders of magnitude larger than Earth's aurora. We will relate the mechanisms in Jupiter's magnetosphere to understanding developed in the Earth context. One of the main differences between Jupiter's and the Earth's magnetosphere is the quasi steady source of Alfvén waves deep inside Jupiter's magnetosphere triggered by radial plasma transport. These Alfvénic fluctuations propagate along the closed field lines in Jupiter's middle magnetosphere and counter propagating waves interact non-linearly to create a turbulent cascade of small scale Alvénic fluctuations. When the scales of the fluctuations reach kinetic scales, the fluctuations are dissipated at high magnetic latitudes. At the presence of a net field-aligned electric current also due to radial mass transport, the dissipation process accelerates electrons to produce Jupiter's main auroral oval. We will discuss these mechanisms in detail. We will also present Galileo spacecraft measurement of the Poynting flux and spectral energy fluxes associated with the Alfvénic fluctuations and compare them with recent Hubble Space Telescope (HST) Observations of Jupiter's main auroral oval. We show that the voltage – energy flux relationship inferred from latest HST observations (private communication J.-C. Gérard) fit well with our theoretical model predictions.

SM22C-02 1355h

Nonlinear 3D Dynamics of Intense Electromagnetic Structures in Low-Altitude Auroral Magnetosphere.

Anatoly V. Streltsov (streltsov@dartmouth.edu)

Thayer School of Engineering , Dartmouth College, Hanover, NH 03755, United States

Results from a numerical investigation of a three-dimensional dynamics of intense electric fields and currents frequently observed by polar-orbiting satellites above the auroral ionosphere are presented. A causal explanation of these electromagnetic structures is given in terms of small-scale Alfvén waves generated below the auroral acceleration region in a process of ULF magnetosphere-ionosphere interaction mediated by large-scale Alfvén waves. These waves curry the electromagnetic power from the nightside plasmasheet boundary layer or equatorial magnetosphere where various energy sources reside to the ionosphere. The field-aligned current in the wave causes a microinstability at about 1 R_E altitude. The instability leads to the formation of a collisionless resistive layer (auroral auroral acceleration region), which serves as an effective upper boundary for the resonator cavity (the lower boundary is formed by the ionospheric E-layer). Inside the cavity small-scale, intense electromagnetic structures can be formed by the ionospheric feedback instability when the ionospheric conductivity is low. This study focuses on a three-dimensional aspects of this process. In particular, we consider effects of the finite Hall conductivity and strong convective nonlinearities of a three-dimensional solution on structure and dynamics of the resonant Alfvén waves. Dependency of these nonlinear effects on parameters of the waves (frequency, amplitude, transverse wavelength) and ionospheric plasma is investigated. Relevance of the numerical results to selected auroral observations and recent theoretical studies is discussed.

SM22C-03 1410h

Alfven Wave Aurora on the Polar cap Boundary:FAST/Cluster Observations

Christopher Carew Chaston[1] (1-510-643-1077; ccc@ssl.berkeley.edu); Charles Carlson[1] (cwc@ssl.berkeley.edu); Laura Peticolas[1] (lmp@ssl.berkeley.edu); John Bonnell[1] (jbonnell@ssl.berkeley.edu); James McFadden[1] (mcfadden@ssl.berkeley.edu); Robert Ergun[2] (ree@lasp.boulder.edu); Robert Strangeway[3] (strange@igpp.ucla.edu); Cluster Team[4] (cluster@space.org)

[1]Space Sciences Laboratory, University of California, Berkeley, CA 94720, United States

[2]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO 80303, United States

[3]Institute for geophysical and Planetary Physics, University of California, Los Angeles, CA 90095, United States

[4]Cluster team Sites, European Space Agency, Several MANY

Aurora on the open/closed field line boundary on the poleward edge of the auroral oval are powered by dispersive Alfven waves. By the use of observations from the FAST and Cluster spacecraft when in magnetic conjunction we identify these waves at different points along the same fieldline. The dispersive nature of the waves at each altitude is tested against existing theories for wave dispersion where finite electron inertia and finite gyro-radii become important. The multipoint observations enable a direct comparison of the electron energy flux and wave Poynting observed at each spacecraft to determine the altitude where most of the observed electron energisation occurs and how

SM