changed to provide an affordable mission concept that still meets the major science goals. Spacecraft accommodation studies, performed by industry in 2003, have now provided mission designs that are consistent with the cost and weight constraints and have highlighted major mission challenges. Preliminary plans are for NASA to issue a GEC Announcement of Opportunity (AO) in 2004 for launch in about 2009.

SA12B-1103 1330h POSTER

Ionospheric Research with Miniaturized Plasma Sensors Aboard FalconSAT-3

Linda Habash Krause[1] (719.333.4619; Linda.Krause@usafa.af.mil)

Fred A. Herrero[2] (Federico.A.Herrero@nasa.gov)

Francis K. Chun[1] (Francis.Chun@usafa.af.mil)

M. Geoff McHarg[1] (Matthew.McHarg@usafa.af.mil)

[1]United States Air Force Academy, Department of Physics, HQ USAFA/DFP 2354 Fairchild Drive, Suite 2A43, USAF Academy, CO 80840, United States

[2]NASA Goddard Space Flight Center, Detector Systems Branch, Code 553, Greenbelt, MD 20771, United States

Investigations into a novel technique to measure ionosphere-thermosphere parameters have culminated in the Flat Plasma Spectrometer (FLAPS) experiment, presently under development through a collaboration between NASA Goddard Space Flight Center (GSFC) and the U. S. Air Force Academy (USAFA). FLAPS is capable of providing measurements of the full neutral wind vector, full ion-drift velocity vector, neutral and ion temperatures, and deviations from thermalization. In addition, coarse mass spectroscopy is possible using an energy analysis technique. The suite of instruments is comprised of a set of 16 individual neutral and ion analyzers, each of which is designed to perform a specific function. Advances in miniaturization technology have enabled a design in which the 16-sensor suite resides on a circular microchannel plate with an effective area of 25 cm^2. The FLAPS electronics package, consisting of low voltage and high voltage power supplies, a microprocessor, and Application Specific Integrated Circuit (ASIC) amplifiers, requires a volume of 290 cm^3, power of 1.5 W, and a mass of 500 g. The suite requires a +5V regulated power line from the spacecraft, and the telemetry interface is a 5.0 V TTL-compatible serial connection. Data collection rates vary from 1 to 1000 (192 Byte) spectra per second. The motivation for the FLAPS experiment is driven by objectives that fall into both basic science and technology demonstration categories. Scientifically, there is strong interest in the effects of ionosphere-thermosphere coupling and non-thermalized plasma on the processes associated with equatorial F-region ionospheric plasma bubbles. These bubbles have been known to scintillate transionospheric propagation of radio waves, often resulting in disruptions of space-based communication and navigation systems. FLAPS investigations will assist in quantifying the impact of various processes on the instigation or suppression of plasma bubbles; certain outstanding questions include 1) What is the relevance of meridional winds in suppression of plasma bubble growth? 2) What role does a velocity space instability driven by non-thermalized plasma play in the generation of small scale ($<$1 km) bubbles? 3) What process is responsible for turbulence in plasma beyond the edges of a bubble structure? Technologically, the need for small yet capable instruments arises from the desire to make multipoint *in situ* measurements of "microscopic" plasma parameters to provide insight into "macroscopic" phenomena. Examples include coherency of spatial boundaries of large-scale ($\sim$100 km) plasma bubbles, three dimensional structure of the equatorial wind and temperature anomaly, and vertical velocity gradients in the low latitude ionosphere. This paper provides an overview of the experiment motivation and instrument design of the FLAPS experiment.

SA12B-1104 1330h POSTER

ROCSAT II Airglow Instrument for Upper Atmospheric Research

J. B. Nee (4227151-5311)

National Central University, Department of Physics, Chung-Li 32054, Taiwan

ROCSAT II is an upper atmospheric research satellite to be launched in the end of 2003. The remote sensing instrument-ISUAL include a few imaging and photometric detectors to measure the optical emissions generated by atomic and molecular species in the upper atmosphere. The instrument was designed to study the upper atmospheric lightening- the SPRITES. However, there are aurora and airglow modes to be utilized for aeronomy studies . Furthermore, the Sprite involves many similar optical emissions generated as the airglow. The ROCSAT II Sprite experiment consist of a CCD imager, six-channel photometers, and a 2-channel photometer array, by using filters centered at the wavelengths 557.7 , 630, 760 nm for CCD and additionally 432.7, 777.4 and 762 nm for photometer. The CCD imager will be most useful for studying the airglow globally. The following is a list of the planned airglow research: (1) The global and equatorial distributions of airglow emissions: O(1D), O(1S), and O2(b) (2) The basic physical and chemical process to generate the airglow, such as the production mechanism, (3) Measurements of atmospheric parameters and compositions including the profiles of electron, O atom, ozone. (4)The dynamics of the atmosphere including gravity waves, temperature inversion, tidal and planetary waves, (5) The long term changes of the upper atmosphere related to the cooling of the upper atmosphere due to green house effects. These studies will be compared with previous measurement such as UARS in 1992-1998. The O2 A band airglow will be used as an example.

SA12B-1105 1330h POSTER

Spacecraft Charge Monitor

Luke Goembel (410-377-6828; luke@goembel.biz)

Goembel Instruments, 1020 Regester Avenue, Baltimore, MD 21239, United States

We are currently developing a flight prototype Spacecraft Charge Monitor (SCM) with support from NASA's Small Business Innovation Research (SBIR) program. The device will use a recently proposed high energy-resolution electron spectroscopic technique to determine spacecraft floating potential. The inspiration for the technique came from data collected by the Atmosphere Explorer (AE) satellites in the 1970s. The data available from the AE satellites indicate that the SCM may be able to determine spacecraft floating potential to within 0.1 V under certain conditions. Such accurate measurement of spacecraft charge could be used to correct biases in space plasma measurements. The device may also be able to measure spacecraft floating potential in the solar wind and in orbit around other planets.

URL: http://www.goembel.biz

SA12B-1106 1330h POSTER

Next Generation Plasma Impedance Probe Instrumentation Technique

Chad G Carlson[1] (435-797-4691; chad.carlson@sdl.usu.edu)

Charles M Swenson[1] (435-797-2958; charles.swenson@ece.usu.edu)

Chad Fish[2] (435-797-0469; chad.fish@sdl.usu.edu)

[1]Utah State University, 4120 Old Main Hill, Logan, UT 84322, United States

[2]Space Dynamics Laboratory, 1695 N. Research Park Way, North Logan, UT 84341, United States

Four Utah State University Plasma Impedance Probes (PIP) were part of NASA's Sequential Rocket Study of Descending Layers in the E-Region (E-Winds). The payloads were launched at 11:19 pm, 1:41 am, 2:50 am and 3:07 am on June 30 and July 1, 2003 from Wallops Island, Virginia into the nighttime D and E-regions. The PIP is a suite of instruments for observing relative and absolute electron densities, magnetic field strength, and electron-neutral collision frequency. The suite consists of a Plasma Frequency Probe, a Swept Impedance Probe, a Q probe, an experimental Ion Impedance probe, and a DC Langmuir probe. The first four instrument diagnostics are based on the impedance characteristics of an antenna immersed in plasma. Resonance effects at low frequencies (1-100 kHz) where ion dynamics become important were observed by the Ion Impedance Probe. This data set may lead to the first mid-latitude measurements of ion-neutral collision frequency and full conductivity measurements of the ionosphere. Preliminary analysis of flight data shows a considerable amount of sensitivity in all of the instruments that should allow for absolute electron density measurement in the 1 to 10 per cc range and comparable accuracy in electron neutral collision frequency. This paper presents the instrumentation techniques, calibrations and initial results for this flight.

SA12B-1107 1330h POSTER

Observations of vehicle charging in dusty plasma

Aroh Barjatya[1] (Arohb@cc.usu.edu)

Charles Swenson[1] (Charles.Swenson@usu.edu)

[1]Utah State University, Department of Electrical and Computer Engineering, 4120 Old Main Hill, Logan, UT 84322

The NASA Sudden Atom Layer (SAL) rocket was launched in February of 1998 from Puerto Rico into an approximately 5 km thick sodium layer that peaked at 94 km altitude. This layer was observed from ground based lidar as well as the Arecibo Radar. The instrument payload consisted of a charged dust detector, an electric field probe, a DC Langmuir probe, and a RF impedance probe. The instruments experienced an anomalous charging event as the rocket passed through this sodium layer. We present here an analysis of the DC Langmuir probe data and the RF impedance probe data to compute the amount of vehicle charging attributed to charged dust. Possible scenarios that could lead to the observed charging effects on the instruments are investigated using a novel SPICE model. The model development and its features are also presented in this paper. Finally, our findings are also compared with those of the dust detector.

SA21A MCC: 2006 Tuesday 0800h

Small-Scale Processes in the High-Latitude E Region I *(joint with SM, AE)*

Presiding: **M Conde,** University of Alaska**; M Larsen,** Clemson University

SA21A-01 0800h INVITED

Small-Scale Structure in the Auroral Thermosphere Determined from Rocket and Ground-Based Observations during the CODA and ARIA Set of Experiments

Andrew B Christensen[1] (714-593-3833; andrew.b.christensen@aero.org)

Miguel Larsen[2] (mlarsen@clemson.edu)

[1]The Aerospace Corporation, PO Box 92957, Los Angeles, CA 90009, United States

[2]Clemson University, 117 Kinard Lab, Clemson, SC 29634, United States

A set of rocket and ground-based experiments were carried out between 1992 and 2000 at Poker Flat Alaska in the CODA and ARIA experiments to study the state of the thermosphere during primarily diffuse auroral heating events. Both instrumented payloads and chemical release payloads were launched to measure the compositional and wind properties of the lower thermosphere, generally in the altitude region between 90 and 200 km, in order to study the response to small-scale forcing and the gradients in the forcing that existed within the auroral oval. Contrary to conclusions based on early models that predicted enhanced winds over a large range of altitudes, the ARIA results showed large winds in a narrower height range near 100 to 120 km with a vertical scale of only 10 to 20 km. The wind speeds were also smaller than the theoretical predictions except in the most disturbed conditions. Measurements over a range of activity levels from the set of rocket experiments have shown a transition from quiet-time tidal winds with peak speeds of approximately 100 m/s to sub-storm winds with wind speeds up to 250 m/s and strong shears in the lower E-region. Richardson numbers associated with the strong wind shears have been well below the usual instability threshold of 0.25, implying strong instability and turbulence generation in the flow and photographs of the chemical release plumes are suggestive of Kelvin-Helmholtz instabilities. Several different techniques were used to measure the composition in the lower thermosphere during these experiments with varying degrees of success. These included in situ rocket measurements of atomic oxygen using resonance lamp techniques, nitrogen and molecular oxygen using a neutral mass spectrometer, and the O/N2 ratio using rocket-borne and ground-based optical remote sensing techniques. The most striking aspects of these observations are the temporal variability and large magnitude of the atomic oxygen depletions that far exceed model expectations. The contributions these experiments have made to our understanding of the small-scale structure in the lower thermosphere and the questions remaining unanswered will be reviewed.

SA21A-02 0815h

Atomic Oxygen Depletion Observations in a Diffuse Aurora

Pat Patterson[1] (435 797- 4112; patp@sdl.usu.edu)

Charles Swenson[1] (435 797 - 2958; Charles.Swenson@usu.edu)

Keith Melville[1] (Keith.Melville@sdl.usu.edu)

A B Christensen[2] (Andrew.B.Christensen@aero.org)

James Clemmons[2] (James.H.Clemmons@aero.org)

[1] Utah State University Department of Electrical and Computer Engineering, 4120 Old Main Hill, Logan, UT 84322

[2] The Aerospace Corporation, 2350 E. El Segundo Blvd., El Segundo, CA 90245-4691

An Atomic Oxygen sensor was launched aboard the Coupling of Dynamics and Aurora (CODA) payload at 06:20 LT on January 22, 1999 from Poker Flat, Alaska and again at 0:55 LT on February 21, 2001, both into diffuse auroras. Atomic oxygen profiles were measured in situ by a combination of resonance and florescence techniques. Comparison of the data reveals significant structural differences between the two flights. While the first flight shows similar densities and layer thickness on the upleg and downleg portions, the second flight records a significant erosion of the top side atomic oxygen profile over a 30 km horizontal extent. One possible explanation is that turbulent mixing forced by the diffuse aurora is driving the atomic oxygen recombination rate. This data indicates the spatial scales over which composition changes can occur in the auroral regions and give insight into the O/N_2 ratios measured by GUVI on the TIMED spacecraft.

SA21A-03 0830h

The State of the Neutral Atmosphere and the Electron Precipitation During JOULE From the Photometer and Electron Energy Analyzer Experiments

James H Hecht[1] (james.hecht@aero.org)

James H Clemmons[1] (james.clemmons@aero.org)

Penny L Slocum[1] (penny.slocum@aero.org)

Doug Strickland[2] (dstrick@cpi.com)

[1] Space Science Applications Laboratory,The Aerospace Corporation, PO Box 92957, Los Angeles, CA 90009

[2] Computational Physics Inc., 8001 Braddock Rd Ste 210, Springfield, VA 22151

The JOULE rocket experiment was launched from Poker Flat Research Range at 12:09:01 UT on March 27th 2003. The payload included two instruments built at Aerospace Corporation designed to measure the neutral atmosphere and the associated particle precipitation. The photometer experiment consisted of three liquid nitrogen cooled filter photometers which measured the emission from the the N2+ (0,0) band at 391.4 nm, the N2 2P (0,0) band at 337.1 nm, and the OI emission at 844.6 nm. These data when combined with the Strickland electron transport code are used to derive the atomic oxygen to molecular nitrogen ratio between 100 and 200 km. They can also be used to derive the electron energy flux and electron average energy. The electron energy analyzer (EEA) experiment is a top hat style instrument to provide in-situ measurements of the precipitating electron fluxes and their small-scale variations. The energy range of the EEA is from 10 eV to 30 keV in 50 exponentially-spaced steps. These data provide a precise measure of the electron energy spectrum at the rocket altitude. These two independent results will be compared. In addition the EEA data can be combined with the photometer data to provide the atomic oxygen and molecular nitrogen density profiles along the rocket trajectory. Ground-based data were also obtained from Poker Flat and Fort Yukon during this experiment Results from all these data sets will be discussed.

SA21A-04 0845h

Does the thermosphere play a role in the formation of patches?

Alan G Burns[1] ((303)497-2178; aburns@ucar.edu)

Wenbin Wang[1] (wbwang@ucar.edu)

Timothy L Killeen[1] (killeen@ucar.edu)

[1] NCAR, PO Box 3000, Boulder, CO 80307-3000, United States

Both the thermosphere and the ionosphere react to forcing from the magnetospherically imposed convection pattern. A twin-celled, neutral convection pattern is set up that normally follows the ion convection pattern. Like the tongue of ionization, which is created by ion convection advecting F2 region ions across the magnetic polar cap, there is a tongue of neutral composition in which gas from the dayside is advected across the polar cap. The composition in this tongue is characterized by less enhanced N2/O ratios than elsewhere in the polar cap and hence potentially less recombination. However, unlike the ionosphere, the thermosphere takes a considerable time to react to geomagnetic forcing. In solar maximum conditions this reaction can take 1 to 3 hours. In this study we use a thermosphere ionosphere nested grid (TING) simulation of a geomagnetic storm to determine whether this behavior of the thermosphere has any influence on the patches that are created by the model.

SA21A-05 0900h

Comparison of the Modeled 135.6 nm Auroral Emission to TIMED GUVI Observations: Mapping Thermospheric Composition Variations During Auroral Events Above Alaska and Northwest Canada

Matthew P. Krynicki[1] (907-474-7578; ftmpk@aurora.uaf.edu)

Mark Conde[1] (907-474-7347; Mark.Conde@gi.alaska.edu)

Dirk Lummerzheim[1] (907-474-7564; lumm@gi.alaska.edu)

Larry Paxton[2] (Larry.Paxton@jhuapl.edu)

Mamoru Ishii[3] (mishii@crl.go.jp)

[1] Geophysical Institute, University of Alaska-Fairbanks PO Box 757320, Fairbanks, AK 99775-7320, United States

[2] The Johns Hopkins University Applied Physics Laboratory, Space Department, 11100 Johns Hopkins Rd, Laurel, MD 20723, United States

[3] Communications Research Laboratory, Ministry of Posts of Telecommunications, Koganei, Tokyo 184-8795, Japan

Satellite imaging of the far ultraviolet (FUV) aurora provides not only the opportunity to infer characteristics of the precipitating auroral electrons (energy flux and mean energy), but also the relative abundance of thermospheric neutral constituents compared to model estimates. Using TIMED GUVI observations of the molecular nitrogen LBH-Long (165-180 nm) and -Short (140-150 nm) auroral emissions, we derive horizontal maps of the energy flux and mean energy parameters. With these, we derive the modeled atomic oxygen 135.6 nm emission, which is then compared to GUVI 135.6 nm observations. From this comparison, we derive a third parameter referred to as the column shift, which varies the 135.6 nm model [Lummerzheim and Lilensten, 1994] estimate by shifting the MSIS-90 [Hedin, 1991] model [O] / [N_2] ratio up or down while maintaining total mass density at each altitude (pressure level), subsequently redistributing the O and N_2 densities at each altitude. Thus, the column shift, which acts as a composition perturbation in the model in the vertical direction, may represent a real thermospheric composition disturbance in the vertical direction. With this in mind, Fabry-Perot spectrometer (FPS) measurements of lower thermospheric vertical winds and temperatures obtained in Alaska and Northwest Canada are compared with the column shift parameter to determine any possible correlations. Some new statistical properties of the column shift, based on this analysis as applied to POLAR UVI data as well as GUVI data, are also presented. Hedin, A. E., Extension of the MSIS thermosphere model into the middle and lower atmosphere, J. Geophys. Res., 96, 1159-1172, 1991. Lummerzheim, D. and J. Lilensten, Electron transport and energy degradation in the ionosphere: evaluation of the numerical solution, comparison with laboratory experiments and auroral observations, Ann Geophysicae, 12, 1039-1051, 1994.

SA21A-06 0915h

Horizontal Distributions of Thermospheric Vertical Winds in the Polar Region

Mamoru Ishii[1] (+81-42-327-7540; mishii@crl.go.jp)

Minoru Kubota[1] (+81-42-327-5378; mkubota@crl.go.jp)

Mark Conde[2] (Mark.Conde@gi.alaska.edu)

Roger W. Smith[2] (Roger.Smith@gi.alaska.edu)

Matthew Krynicki[2] (ftmpk@aurora.alaska.edu)

[1] Communications Research Laboratory, 4-2-1 Nukuikita, Koganei, Tokyo 184-8795, Japan

[2] Geophysical Institute, University of Alaska, 903 Koyukuk Dr., Fairbanks, AK 99775-7320, United States

Thermospheric vertical winds can play a significant role in the thermospheric dynamics, energy balance between thermosphere and ionosphere, and displacement of the altitude profiles of mixing ratio for each atmospheric species. Optical measurements with Fabry-Perot Interferometers are powerful method to observe vertical winds, but the observing area is restricted in small portion of the sky just above the instruments. Several attempts have been executed to extend the observable region. Innis and Conde [2002a,b] shows thermospheric vertical winds obtainedfrom DE2 satellite data (WATS, NACS). In the recent studies, a rocket experimentwith TMA trail measured horizontal distribution of vertical winds in HEX (Horizontal E-region eXperiments) campaign on March 2003. In this campaign, multi-site observation with Fabry-Perot Interferometers was conducted for another approach. In this study, we will show several results of detailed analysis obtained with two Fabry-Perot Interferometers at Poker Flat Research Range (PFRR) and Eagle (EGL). These two sites are separated about 300 km along a typical auroral arc and we can expect to deduce vertical wind distribution on the vicinity of auroral arc from these results. The present results show that the vertical winds estimated from OI557.7nm at the two sites has high correlation (the correlation coefficients are higher than 0.6 in six of 13 nights). In many of low correlated cases, one observatory (EGL in most cases) was displaced from auroral arc. This results mean that the neutral wind system is uniform along the auroral arc. Innis, J. L., and M. Conde, High-latitude thermospheric vertical wind activity from Dynamics Explorer 2 Wind and Temperature Spectrometer Observations: Indications of a source region for polar cap gravity waves, J. Geophys. Res., 107, A8, 10.1029/2001JA009130, 2002a. Innis J. L., and M. Conde, Characterization of acoustic-gravity waves in the upper thermosphere using Dynamics Explorer 2 Wind and Temperature Spectrometer (WATS) and Nuetral Atmosphere Composition Spectrometer (NACS) data, J. Geophys. Res., 107, A12, 10.1029/2002JA009370, 2002b.

SA21A-07 0930h

The HEX Experiment: Determination of the Neutral Wind Field From 120 to 185 km following moderate auroral precipitation from triangulation of TMA trails.

Eugene M. Wescott[1] (1-907 -474 -7576; gene.wescott@gi.alaska.edu)

Hans C. Stenbaek-Nielsen[1] (1-907-474 -7414; hnielsen@gi.alaska.edu)

Miguel F Larson[2] (1-864-656-5309; mlarsen@clemson.edu)

Mark G Conde[1] (1-907-474-7347; mark.conde@gi.alaska.edu)

Dirk Lummerzheim[1] (1-907-474-7564; lumm@gi.alaska.edu)

[1] Geophysical Institute, University of Alaska Fairbanks, PO Box 757320, Fairbanks, AK 99775-7320, United States

[2] Clemson University, Clemson University Dept. of Physics and Astronomy College Sciences, Clemson, SC 29631, United States

In March 2003, as part of the HEX rocket mission, tri-methyl aluminum (TMA) trails were released from two rockets launched northward from the Poker Flat rocket range near Fairbanks Alaska. The trails were captured on video recorders from four stations: Poker Flat, Toolik Lake, Arctic Village in Alaska, and Old Crow, in the Canadian Yukon Terr. Triangulations were performed using star backgrounds in the trail images, yielding trail positions accurate to 1 km. The first guided, and re-oriented, rocket released a nearly horizontal trail designed to measure vertical and horizontal winds. TMA puffs were released starting at 146.5 km up to apogee at 155 km, and then down to 137 km. The puffs drifted downward and geomagnetically westward parallel to the aurora. All vertical velocities were downward, even in the vicinity of the quiet arc. There was no evidence of a convective upward wind generated by heating associated with the arc, as might be expected from particle precipitation or Joule heating. The second TMA rocket followed the first by about 17 minutes, and released puffs after apogee from 200 to 120 km altitude, overlapping some of the southern portion of the H trails. The results were similar to the horizontal rocket results, downward and geomagnetically westward drifts. This shows that the wind pattern was persistent over at least twenty minutes. These triangulated results show that stable pre-midnight quiet arcs do not drive enhanced vertical circulation in the E-region, and are not what are responsible for carrying heavy molecular species aloft.

SA21A-08 0945h

Implications of results from the HEX sounding rocket mission

Mark G Conde[1] (907-474-7347; mark.conde@gi.alaska.edu); John D Craven[1] (907-474-5888; john.craven@gi.alaska.edu); Miguel F Larsen[3] (864-656-5309; mlarsen@clemson.edu); Eugene M Wescott[1] (907-474-7576; gene.wescott@gi.alaska.edu); Hans Stenbaek nielsen[1] (907-474 -7414; hans.nielsen@gi.alaska.edu); Dirk Lummerzheim[1] (907-474-7564; dirk.lummerzheim@gi.alaska.edu); Bruce A Johnson[2] (907-474-5978; baj@gci.net); Joseph G Hawkins[1] (907-474-5206; ffjgh@uaf.edu); Roger W Smith[1] (907-474-7282; roger.smith@gi.alaska.edu)

SA

[1]Geophysical Institute University of Alaska Fairbanks, 903 Koyukuk Drive, Fairbanks, AK 99775, United States

[2]Department of Electrical Engineering University of Alaska Fairbanks, Box 751841, Fairbanks, AK 9975, United States

[3]Physics and Astronomy Department Kinard Laboratory , Clemson University, Clemson, SC 29634-1911, United States

Numerous ground and space-based measurements have shown that the aurora modifies thermospheric composition by increasing, relative to diffusive equilibrium, the mixing ratio of heavy molecular species at higher altitudes. The presumed mechanism for this mixing has been vertical wind circulation driven by the aurora. However, prior to the HEX rocket mission, no experiment had ever tested this hypothesis by mapping the actual vertical wind field in the E-region near an individual auroral arc. With HEX, we measured the vertical wind as a function of latitudinal distance from a pair of quiet pre-midnight arcs, using a visible chemical trail deployed along a novel near-horizontal trajectory. Instruments aboard the rocket also observed the in-situ electron density and the auroral luminosity. The measurements were of high quality, and their outcome was clear: The hypothesis was false. No upwelling and no significant mixing were occurring due to this particular system of quiet arcs. Assuming these results are typical, HEX demonstrated that quiet pre-midnight arcs play little role in mixing the thermosphere. With its successful characterization of quiet-time "baseline" conditions, HEX now gives us the tool to study active post-midnight aurora that likely does drive the mixing that has been observed.

SA21B MCC: Level 1 Tuesday 0830h

Ionosphere Measurements and Models I Posters *(joint with AE)*

Presiding: **R E Daniell,** Computational Physics, Inc.

SA21B-0065 0830h POSTER

Ion temperature climate in the polar ionosphere using incoherent-scatter radars

Shin-ichiro Oyama[1] (907 474 5323; soyama@gi.alaska.edu)

Chantal Lathuillere[2] (Chantal.Lathuillere@obs.ujf-grenoble.fr)

Sawako Maeda[3] (smaeda@kyoto-wu.ac.jp)

Brenton J Watkins[1] (ffbjw@uaf.edu)

[1]Geophysical Institute University of Alaska Fairbanks, 903 Koyukuk Drive P.O. Box 757320, Fairbanks, AK 99775-7320, United States

[2]Laboratoire de Planetologie de Grenoble, Batiment D de Physique, BP 53, Grenoble 38041, France

[3]Kyoto Women's University, 35 Kita-Hiyoshi Imakumano, Higashiyama, Kyoto 605-8501, Japan

We focus on seasonal and solar activity dependences of the ion temperature in the polar ionosphere using data from several incoherent scatter-radars (ISR): the Sondrestrom ISR (67°N, 309°E, 74° magnetic latitude), the European Incoherent Scatter (EISCAT) UHF Tromsø radar (69°N, 19°E, 66° magnetic latitude), and the EISCAT Svalbard radar (ESR: 78°N, 16°E, 75° magnetic latitude). Since these radars are located at different magnetic latitudes, we can estimate the meridional structure of ion temperature from the statistical results calculated using long-term data sets. Below about 300 km, the energy transfer from neutrals to ions plays a significant role than that from electrons because the ion-neutral collision frequency is much higher than the ion-electron collision frequency for this height region. While studies of neutral temperature using the ion temperature data from ISRs have been conducted for more than two decades, the relationship between the ion and neutral temperatures is not well known at high latitudes because of recurrent joule energy dissipation. On the other hand, above 300 km the energy transfer from electrons through collisions becomes important with increasing heights. The statistical results from the EISCAT Tromsø radar data for about one solar cycle show that for summer the ion temperature in the upper F-region has higher values at local night than at local noon, and for other seasons daytime values are higher than night values. Statistical results for the ESR data show not only summer, but also some other seasons, show higher temperatures at local night than at local noon in this height region. In the case of the Sondrestrom radar data, the ion temperatures at summer night are also higher than the daytime values. These characteristics are not in agreement with standard model profiles of the ion temperature. The different characteristics suggest that the ion temperature climate in the polar ionosphere should have the meridional structure, which might be associated with the auroral oval. We will show these differences as well as other climate of the ion temperature in more detail in the presentation.

SA21B-0066 0830h POSTER

The Ionospheric Cusp, A Region of Thermospheric Up-welling

Hermann Luhr[1] (+49 331 288-1735; hluehr@gfz-potsdam.de)

Wolfgang Koehler[1] (wolfk@gfz-potsdam.de)

Martin Rother[1] (rother@gfz-potsdam.de)

Patricia Ritter[1] (pritter@gfz-potsdam.de)

[1]GeoForschungsZentrum Potsdam, Telegrafenberg, Potsdam D-14473, Germany

The satellite CHAMP with its sensitive accelerometer on board provides the opportunity to investigate the thermospheric dynamics in great detail. On its near-polar, low-Earth (about 400 km) orbit it is well suited to map the air density along the track. In this study we concentrate on density structures in the auroral region. Special attention is paid to features in the cusp. During 25 Sep. 2000, the day we take as an example, air density enhancements of almost a factor of two are observed whenever the satellite passes the cusp region. For the interpretation of these events we consider also the concurrent ionospheric Hall and field-aligned currents (FACs) which are estimated from the magnetic field measurements. As expected, sizable currents are found in the regions of dense air. The reverse is however not always true. On the nightside there are partly even stronger currents, but no thermospheric response is observed. Small-scale FAC filaments (1-km size) seem to play an important role in the heating. Whenever these very intense FACs with amplitudes of several hundreds of A/km**2 show up, density enhancements occur. So far these FAC filaments have not received a lot of attention in the context of Joule heating. Our new observations suggest that the cusp, where small-scale FACs occur rather frequently, seems to be a prominent region for refilling the upper atmosphere.

SA21B-0067 0830h POSTER

Variability of High-Latitude Vertical Plasma Flux using DMSP Measurements

William Robin Coley[1] (972-883-2872; coley@utdallas.edu)

Rod A. Heelis[1] (972-883-2822; heelis@utdallas.edu)

[1]William B. Hanson Center for Space Sciences University of Texas at Dallas, P.O. Box 830688, MS FO22, Richardson, TX 75083, United States

We have examined characteristics of the vertical ion flux in the topside high-latitude ionosphere from measurements of the vertical ion drift and ion number density made by the DMSP F13 satellite. In the polar cap the vertical ion flux is uniformly downward at all locations. However, in the auroral zone the ion flux is highly structured and a net upward flux is produced only by spatially and temporally confined events containing upward fluxes in excess of 10^9 $cm^{-2}s^{-1}$ that have no downward counterparts. The distribution of the plasma's vertical flux varies by both season and solar cycle with wider variability occurring during winter and at lower levels of solar activity. We also look at variations of the upward flux events as a function of geomagnetic activity.

SA21B-0068 0830h POSTER

Ionospheric Data Assimilation 3D (IDA3D), SuperDARN, and Magnetometer Analysis of Currents Over Greenland

Gary S. Bust[1] (512-835-3623; gbust@arlut.utexas.edu); Trevor W. Garner[1] (garner@arlut.utexas.edu); Thomas L. Gaussiran[1] (gauss@arlut.utexas.edu); D. L. Murr[2] (david.murr@dartmouth.edu); Simon Shepherd[2] (simon.shepherd@dartmouth.edu); Jürgen Watermann[3]

[1]Applied Research Laboratories, The University of Texas at Austin, 10000 Burnet, Austin, TX 78758, United States

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

[3]Danish Meteorological Institute, Lynbyvej 100, Copenhagen DK-2100, Denmark

A high latitude tomography array has been deployed and operated along the west coast of Greenland since September 2000. The array routinely produces two-dimensional images of electron density along the array axis. While two-dimensional images have tremendous value, in order to investigate the structure of conductances and currents a local three-dimensional analysis is necessary. We have recently developed a full three-dimensional space weather analysis algorithm called ionospheric data assimilation 3D (IDA3D). In addition to the tomographic data from the Greenland array, this algorithm ingests data from ground GPS, GPS occultations, ionosondes and DMSP measurements to compute the 3D electron density over the entire high latitude ionosphere. From the three-dimensional estimation of electron density, local estimations of conductances can be derived. By combining the IDA3D estimation of conductances with convection velocities measurements from SuperDARN and magnetometer measurements we are able to investigate the local three-dimensional structure of current density over Greenland. We present an analysis of the local Greenland current density structure. The analysis includes combining IDA3D derived conductances with SuperDARN convection velocity measurements to obtain currents, which can then be compared with equivalent currents obtained from magnetometer data. Conversely, magnetometer estimates of equivalent currents can be combined with IDA3D conductances and compared with SuperDARN convection velocities. Results are presented for several days analysis in winter of 2001.

SA21B-0069 0830h POSTER

Energy Distribution of Precipitating Electrons Estimated From Optical and Cosmic Noise Absorption Measurements

Hirotaka Mori[1] (81-42-327-7539; mori@crl.go.jp); Mamoru Ishii[1]; Yasuhiro Murayama[1]; Minoru Kubota[1]; Kazuyo Sakanoi[1]; Masa-yuki Yamamoto[2]; Yoshizumi Monzen[3]; Dirk Lummerzheim[4]; Brenton J. Watkins[4]

[1]Communications Research Laboratory, 4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8795, Japan

[2]Kochi University of Technology, 185 Miyanokuchi, Tosayamada, Kochi 782-8502, Japan

[3]University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan

[4]Geophysical Institute, University of Alaska Fairbanks, 903 Koyukuk Drive, Fairbanks, AK 99775-7320, United States

This study is a statistical analysis on energy distribution of precipitating electrons, based on CNA (cosmic noise absorption) data obtained from the 256-element imaging riometer in Poker Flat, Alaska, and optical data measured with an meridian scanning photometer over 79 days during the winter periods from 1996 to 1998. On the assumption that energy distributions of precipitating electrons represent Maxwellian distributions, CNA is estimated based on the observation data of auroral 427.8-nm and 630.0-nm emissions as well as the average atmospheric model, and compared with the actual observation data. Although the obsevation data have a broad distribution, they show systematically larger CNA than the model estimate. CNA determination using kappa or double Maxwellian distributions, instead of Maxwellian distributions, better explains the distribution of observed CNA data. Kappa distributions represent a typical energy distribution of electrons in the plasma sheet of the magnetosphere, the source region of precipitating electrons. This result suggests that the energy distribution of precipitating electrons reflects the energy distribution of electrons in the plasma sheet.

SA21B-0070 0830h POSTER

A Sequential Sounding Rocket Flight Through Nighttime Midlatitude Plasma Layers

Patrick A Roddy[1] (1-469-569-7175; roddy@utdallas.edu); Greg D Earle[1] (earle@utdallas.edu); Miguel F Larsen[3] (mlarsen@celmson.edu); Rebecca L Bishop[3] (rbishop@clemson.edu); Charles Swenson[2] (charles.swenson@usu.edu); Chad G Carlson[2] (chad.carlson@sdl.usu.edu); Terence W Bullett[4]

[1]William B. Hanson Center for Space Science, University of Texas at Dallas, 2601 N. Floyd Road MSFO22, Richardson, TX 75080, United States

[2]Utah State University, 4100 Old Main Hill, Logan, UT 84322, United States

[3]Department of Pysics, Clemson University, 118 Kinard Laboratory, Clemson, SC 29634, United States