

terms of particle distribution weights and Mie scattering functions. This expansion can be cast in the form of a matrix equation in which one side is the vector of observed scattering ratios in wavelength and the opposite side is the product of a scattering function matrix and the particle distribution in size. Direct inversion of this equation determines the actual particle distribution without recourse to assumptions about its shape or amplitude. This method is applied to MSX data and the results compared to commonly-assumed PMC distributions such as Gaussian and lognormal.

**SA62A-0394 1330h POSTER**

**Is the water vapor budget in the summer polar mesosphere understood?**

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Recent observations and model results show that the vertical distribution of water vapor in the summer polar mesosphere is more complex than originally believed. Limb scanning observations of hydroxyl (OH), a product of water vapor photodissociation, have helped to yield new insight into water vapor in the summer polar mesosphere. Analysis of OH observations from the Middle Atmosphere High Resolution Spectrograph Investigation (MAHRSI) revealed a water vapor layer with average peak mixing ratios of 10-15 ppmv near 82 km, at the same altitude as polar mesospheric clouds (PMCs). Microphysical model results have also shown that a layer of water vapor about 1 km thick can build up near 82 km due to the freeze drying, sedimentation and sublimation of PMC ice particles from above. But the narrow vertical structure predicted by models is not easily resolved by MAHRSI. In this work, we will use a one-dimensional microphysical model to quantify the vertical distribution of water vapor near 82 km. By convolving the model results with the vertical resolution of MAHRSI and comparing to the data, we will rigorously test our understanding of the water vapor budget in the summer polar mesosphere. We will also explore whether enhanced water vapor and ice particles near 82 km in the summer polar mesosphere can influence the local thermal structure through increased cooling and heating of the ambient atmosphere.

**SA62A-0395 1330h POSTER**

**Search for Shuttle-Induced PMCs in SBUV and SBUV/2 Data**

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It has recently been suggested that the large amount of water vapor deposited in the upper atmosphere by Space Shuttle rocket exhaust leads to the formation of polar mesospheric clouds (PMCs) during the days following a launch [Stevens et al., *Eos. Trans. AGU*, 83(19), Spring Meeting Suppl., Abstract SA21A-05, 2002]. This conclusion is inferred from MAHRSI OH observations during the STS-66 (November 1994) and STS-85 (August 1997) missions.

The SBUV and SBUV/2 instruments have made PMC measurements continuously since November 1978.

We have examined this database for evidence of anomalous PMCs following Shuttle flights during the period 1985-2001. Daily variations in overall SBUV/2 PMC occurrence frequency can reach a factor of 2 due to natural fluctuations and changes in geographic coverage. We therefore focused on launches occurring near the beginning and end of the nominal Northern Hemisphere PMC season (May 21 - August 31), where typical PMC occurrence frequencies are low. Data for 9 Shuttle launches were examined for evidence of increased PMC frequency and longitudinal clustering. Normal SBUV/2 PMC detections represent only the brightest portion of the overall PMC intensity distribution. We also evaluated the impact of reducing the normal PMC detection threshold to look for fainter PMCs. There is some evidence for increased PMC detections eastward of the United States within 3-5 days following a Shuttle launch. We will present examples of these data.

**SA62B MCC: Hall D Saturday 1330h**

**Scientific Results From the TIMED Mission II Posters (joint with A)**

**Presiding: J M Russell, Hampton University; R Niciejewski, University of Michigan**

**SA62B-0396 1330h POSTER**

**A Re-evaluation of Early Solar EUV and Soft X-ray Flux Measurements**

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Measurements of the solar extreme ultraviolet and soft X-ray spectrum made at the (then) Air Force Geophysics Laboratory (AFGL) by a group under the direction of Hans Hinteregger were the basis for early estimates of the solar flux in the spectral range of 5 to 190 nm. Subsequent studies have indicated a discrepancy between the fluxes reported at the lower end of this spectral range and those required in modeling the Earth's ionosphere. We have examined a possible systematic source of error in the original calibration between 25 nm and 120 nm, the range over which the photoelectric yield of a tungsten surface was the basis for calibration. We find differences (never greater than 30 percent) between the adopted photoelectric yield values as a function of wavelength and measurements made elsewhere. Suggested corrections to EUV fluxes due to these deviations will be presented. To extend the analysis of AFGL results below 25 nm, but only for a period of intermediate solar activity, we use an OSO-5 spectrum between 2.5 and 40 nm having a spectral resolution of 0.05 nm. This spectrum was calibrated in-orbit using coronal density-insensitive emission line ratios and absolute flux measurements at 30.4 nm made independently by an instrument on OSO-4. These data provide independent measurements of solar fluxes in the 3-40 nm region that can be compared with AFGL observations and more recent measurements and flux models for moderate levels of solar activity.

**SA62B-0397 1330h POSTER**

**TIDI Preliminary Wind Results: Tidal Features and Validation Effort**

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Since the launch of the TIMED satellite, the TIDI (TIMED Doppler Interferometer) instrument has been

collecting neutral wind data from the lower thermosphere and mesosphere regions. Preliminary winds from the O<sub>2</sub> (0-0) emission have been produced. These winds are being compared with ground based radar, lidar, and Fabry-Perot Interferometer measurements in an effort to validate these TIDI results. Comparisons with GSWM results are also being made in search of tidal signatures. Although, the TIDI data are still being refined, the preliminary winds show clear tidal features. We will describe our on going effort on validation and progress on processing and analyzing the TIDI neutral wind data.

**SA62B-0398 1330h POSTER**

**Observations of the O<sub>2</sub> Atmospheric Band Nightglow by the TIMED Doppler Interferometer**

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Measurements of the O<sub>2</sub> Atmospheric (0-0) band nightglow layer by the TIMED Doppler Interferometer (TIDI) during 2002 are presented. Because TIDI has four separate telescopes observing in orthogonal directions, good coverage of nightglow morphology in latitude and local time is obtained. The emission intensity and layer height are analyzed to investigate the influence of tidal variability on oxygen recombination.

**SA62B-0399 1330h POSTER**

**Coincidence Observations of Mesopause Region Temperatures and Winds of Ground-based Lidar with TIMED/SABER and TIMED/TIDI**

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The Colorado State Two-beam Na Lidar has been configured for simultaneous measurement of the profiles of temperature, zonal and meridional winds in the mesopause region over Fort Collins (41N, 105W). Observations over full diurnal cycles began in April 2002. To-date, 144 hours of data with simultaneous observation of temperature and zonal wind were acquired in April. Two more campaigns, one between the end of May and the beginning of June and the other between the end of July and the beginning of August were completed, yielding 268 hours and 180 hours of data, respectively, with simultaneous observation of temperature, zonal, and meridional winds. More than one-third of these data were acquired during daytime. Hours of lidar data coincidence with TIMED have been and more will be identified; they will be compared with SABER temperatures and TIDI winds for the purpose of validation and of science study.

## SA62B-0400 1330h POSTER

### Ground-Based Measurements of Mesosphere Temperature and Gravity Wave Structure as Part of the TIMED-CEDAR Collaborative Program

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Ground-based observations of the mesosphere and lower thermosphere (MLT) region provide an effective and complementary component to the TIMED-CEDAR research program. As part of this collaboration two sensitive CCD imaging systems, developed at Utah State University, are being used to investigate two key aspects of mesospheric dynamics: (a) seasonal, diurnal and wave-induced variability in mesospheric temperatures at the ~87 and 94 km level using measurements of the near infrared OH and O<sub>2</sub>(0,1) airglow emissions, and (b) the occurrence and properties of short-period (< 1 hour) gravity waves over the ~80-100 km region using all-sky, multi-wavelength airglow observations. The temperature measurements are being conducted from Maui, HI (20.8 N) alongside the University of Illinois Wind/Temperature lidar as part of the Maui-MALT program. Over 130 nights of data have been obtained since October 2001 providing detailed information on low-latitude mesospheric temperature and its fluctuations of importance to TIMED validation. The small-scale gravity wave measurements are being conducted from Bear Lake Observatory, UT (41.6 N) as part of a chain of imagers designed to investigate the sources and dynamics of short-period waves over the Rocky Mountains which may act to significantly influence the regional mesospheric structure. Examples of the ongoing measurements and data analysis, focusing on the seasonal and nocturnal temperature variability and the gravity wave occurrence frequency during the first 6-months of TIMED operations, will be presented. It is planned to deploy a third imaging system near Ft. Collins, CO to complement ongoing Wind/Temperature lidar and radar measurements.

## SA62B-0401 1330h POSTER

### A Network of Ground-Based Radar Measurements Supporting CEDAR/TIMED

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As part of the CEDAR/TIMED program an ongoing effort is being conducted to organize observations from the global network of ground-based meteor and medium frequency (MF) radars. Currently there is a growing network of scientific investigators from nations around the globe who have been deploying meteor and medium frequency radars for scientific studies of the mesosphere and lower-thermosphere. It is the focus of our effort to bring these data to a central location for dissemination and analysis. Our goal is to utilize these ground-based data in conjunction with the space-based observations of winds in the mesosphere and lower-thermosphere from the TIMED satellite in an effort to understand the large-scale structure and dynamics of this atmospheric region. Such a study is impossible using either isolated ground-based observations or satellite observations only. We will present initial scientific analysis for the 8 data sets currently available during 2002. An overview and update of the current project status will also be presented.

URL: <http://sisko.colorado.edu/TIMED>

## SA62B-0402 1330h POSTER

### Arecibo Observations in support of TIMED

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At the Arecibo Observatory, we are carrying out observations in support of those of the TIMED satellite. The specific goals of these observations are the following:

1) to cross-calibrate with TIMED measurements and overflights; 2) to obtain the average ion mass profile in the D-region and study its diurnal and seasonal variation; 3) to study tides and waves by combining radar and optical observations; and 4) to study the dynamics and composition associated with sporadic E layers.

The purpose of this presentation is to show the observational capabilities for TIMED support at Arecibo and to present some initial results.

## SA62B-0403 1330h POSTER

### Simultaneous Retrieval of Temperature and CO<sub>2</sub> Abundance in the Mesosphere and Lower Thermosphere From SABER Observations of Infrared Limb Emission

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In December 2001, the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) experiment was launched onboard the TIMED satellite. One of the primary goals of SABER is to understand the thermal structure and quantify the major radiative and chemical sources and sinks of energy in the mesosphere and lower thermosphere (MLT). Vertical profiles of kinetic temperature ( $T_k$ ) and CO<sub>2</sub> volume mixing ratio are retrieved simultaneously from SABER broadband measurements of CO<sub>2</sub> 15  $\mu$ m and CO<sub>2</sub> 4.3  $\mu$ m limb emission, respectively. In the MLT region, the CO<sub>2</sub> vibration-rotation bands are in non-local thermodynamic equilibrium (non-LTE), adding considerable complexity and computational burden to the retrieval algorithm. New retrieval approaches and radiative transfer techniques are needed to accurately and efficiently derive  $T_k$ /CO<sub>2</sub> in the MLT region. Infrared emission from CO<sub>2</sub> is the largest source of radiative cooling in the MLT, requiring accurate knowledge of both  $T_k$  and CO<sub>2</sub> abundance. Moreover,  $T_k$  is a key input into the retrieval of all SABER data products. The global distribution of CO<sub>2</sub> is interesting in its own right, as its latitudinal and seasonal variations are not well known, and the mechanism for its departure from uniformly mixed is not well characterized. The excellent quality of the SABER measurements combined with the new coupled non-LTE  $T_k$ /CO<sub>2</sub> retrieval algorithm offer the potential to significantly advance our understanding of the MLT thermal structure and energetics. In this paper, we present the retrieval algorithm and preliminary profiles of  $T_k$  and CO<sub>2</sub> derived from SABER measurements.

## SA62B-0404 1330h POSTER

### The NO 5.3 $\mu$ m radiation and associated atmospheric cooling rates

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The fundamental vibrational-rotation band emission from NO around 5.3  $\mu$ m ( $v=1-v=0$ ) in the thermosphere is generally produced by (1) solar pumping, (2) Earth shine pumping, (3) the inelastic collisions of NO( $v=0$ ) with O, (4) the reaction of N(<sup>4</sup>S) with O<sub>2</sub>, and (5) the reactions of N(<sup>4</sup>S) with O<sub>2</sub>. The relative importance of each source depends on the geophysical conditions (i.e. nighttime, sunlit, or aurora) and location (i.e. latitude, or altitude). Of the five sources of NO( $v=1$ ) considered, the inelastic collisions of NO( $v=0$ ) with O are an effective atmospheric cooling mechanism in the lower thermosphere. This paper discusses the utility and limitations of NO 5.3  $\mu$ m radiance measurements from space such as those obtained by SABER/TIMED for the determination of associated atmospheric cooling rates under various geophysical conditions.

## SA62B-0405 1330h POSTER

### Comparisons of SABER Temperature Profiles With Rocket, Groundbased, and Satellite Measurements

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The SABER instrument has been providing near global measurements of the mesosphere and lower thermosphere since early January 2002. An important goal of that experiment is to obtain the kinetic temperature profile into the lower thermosphere, where the retrieval is complicated by significant contributions due to non-LTE effects and a sharply decreasing CO<sub>2</sub> mixing ratio. Non-LTE effects are most noticeable for high latitude summer because of radiative excitation of CO<sub>2</sub> molecules at the cold mesopause by emissions from the much warmer stratopause and lower mesosphere.

We will show LTE retrievals of temperature from SABER and compare them with correlative measurements from the ground-based sodium (Na) lidar and the falling sphere measurements obtained during the MAC-WAVE observing campaign in northern Europe in early July 2002. We also discuss comparisons with

the UARS HALOE instrument. HALOE obtained sunrise profiles at 67 N on July 4. They show temperatures that decrease smoothly with altitude throughout the mesosphere, but with large variations occurring in a layer above the 0.01-hPa level. Some initial SABER comparisons with HALOE profiles for early March indicate good agreement in the retrieval of LTE temperatures for the stratosphere and mesosphere.

A plot of the zonally-averaged, ascending minus descending orbital LTE temperatures from SABER for early March shows the signature of a diurnal tide clearly. At this time that result is based solely on the observed differences at each latitude and altitude for the two local times of the SABER measurements of early March. This approximate tidal amplitude reaches 15 K in the tropical middle mesosphere; larger amplitudes are found just below the tropical mesopause. Net tidal amplitudes for the middle latitudes are almost directly out-of-phase with and not quite half the magnitude of those at the Equator. Vertical wavelengths for these tidal variations are about 25 km at the Equator but closer to 30 km at 30 degrees latitude.

**SA62B-0406 1330h POSTER**

**SABER Measurement Quality: Limb Scan Performance, Calibration and Validation**

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The SABER instrument is a limb viewing radiometer designed to study the energetics of the mesosphere and thermosphere. It was launched aboard the NASA TIMED satellite in December 2001. Radiance from the target tangent altitudes of 70+ kilometers can be 3 to 6 orders of magnitude smaller than radiance emanating from just below the tropopause. This requires effective (either actual or mathematically corrected) field-of-view performance that provides 10-6 rejection over less than 2 arc-degrees, which is extremely difficult to quantify in the lab. The in-orbit validation/calibration methods used to precisely determine and verify this performance are described. Also presented are other performance factors and related retrieval results.

**SA62B-0407 1330h POSTER**

**Seasonal Variation of Thermospheric Composition as Measured by TIMED/GUVI**

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The GUVI instrument on TIMED provides a dramatic new way to observe compositional changes in the thermosphere, which are important for ionospheric electron densities. The 1356/LBH brightness ratio from GUVI disk observations provides estimates of the column integrated O/N2 ratio. This ratio undergoes seasonal variations which are evident as strong latitudinal gradients in the GUVI data collected between February and November of 2002. Similar variations are predicted by global models. In this paper we discuss the seasonal variation of global 1356/LBH ratio and compare with MSIS and TIMEGCM simulations for the corresponding periods and local times.

**SA62B-0408 1330h POSTER**

**Thermospheric Composition: GUVI Observations of O/N2**

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The Global Ultraviolet Imager (GUVI) is a scientific instrument aboard the TIMED spacecraft launched Dec. 6, 2001 into a 630 km circular polar orbit with an inclination of 74 degrees. The GUVI investigation provides multiple wavelength simultaneous "monochromatic" images of the Earth's ultraviolet airglow and auroral emission in the far ultraviolet (FUV) at wavelengths from 115 nm to 180 nm. Using the measured apparent brightness of atomic oxygen emissions from the OI135.6 multiplet and a segment of the Lyman Birge Hopfield system of N2, swath images of the O/N2 concentration ratio along the satellite orbital path have been derived. The dayglow algorithm of Strickland (2002) specific to the GUVI instrument was used to reduce the sensor data in the 135.6 and LBHs response channels. A period of activity in March 2002 has been analyzed. Comparisons of magnetically quiet (0<Kp<3.5) and somewhat disturbed (2<Kp<6) days with each other and with models (MSIS and TIMEGCM) of the thermospheric O/N2 ratio for these days illustrate the inability of the models to represent important aspects in both the latitudinal and longitudinal behaviour of the O/N2 distribution and its changes with magnetic activity.

Strickland, D. J., Dayglow and auroral remote sensing algorithms for TIMED/GUVI, submitted to J. Geophys. Res., August, 2002.

**SA62B-0409 1330h POSTER**

**Composition Change in the Lower Thermosphere Over Alaska from TIMED/CEDAR Ground-Based and GUVI Observations**

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From January to April 2002 two four-channel photometer systems were operated at Poker Flat and Fort Yukon, Alaska. Each system measured, from dusk to dawn every night, a set of auroral emissions (N2<sup>+</sup>(4278), OI(6300), N2(8714) and OI(8446)) approximately every 10 seconds. From these data the auroral electron flux, average energy of precipitating particles and changes in the thermospheric [O]/[N2] ratio were derived. The latter is characterized by an atomic oxygen scale factor whose value is near 1 for an undisturbed atmosphere. When the atmosphere is perturbed by auroral heating the scale factor often drops to values below 0.5. Because two N2 emissions are measured data can be analyzed even in the presence of thin clouds. Here we present the results for all nights during this period when good aurora were present. On some nights the O scale factor drops after auroral precipitation begins. Recovery of the O scale factor to pre-auroral levels often occurs by the next night. However sometimes, such as during the period of the large late-April storm, the scale factor is low for several nights in a row. We make comparisons with the [O]/[N2] densities derived from the TIMED GUVI data on selected nights. The emphasis for this comparison is during March and April when GUVI obtained data over Alaska during the night.

**SA62B-0410 1330h POSTER**

**Coordinated GUVI, ISR, and imaging observations of the auroral boundary over Sondrestrom**

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From its inception, the mission concept for the TIMED/GUVI instrument has included a series of experiments coordinated with ground-based radars and imagers. The 07 December 2001 TIMED launch and subsequent early turn on of GUVI has enabled a number of wintertime dark-moon campaigns with the Sondrestrom Facility. Of these experiments, the midnight sector GUVI overflight of 17-18 January 2002 presents an ideal ground-based conjunction with an auroral boundary arc nearly stationary at Sondrestrom's zenith. All-sky imagery at 630.0 nm (OI(1D)) indicates that, following the dynamic expansion of an auroral boundary arc from the south to overhead, the location of the boundary emission gradient remains relatively fixed some 6 minutes prior to and during GUVI's overflight. Sequential meridional ISR scans support the premise of a stable boundary with negligible morphological changes in N2(alt,A) over a 4 min scan period. ISR horizon-to-horizon scans and contextual all-sky imagery at 630.0 nm and 427.8 nm (N2<sup>+</sup>) allow direct measurement and estimates for GUVI key parameters such as the E-region electron density profile, auroral boundary location, electron energy flux, electron characteristic energy, and conductances. Ground-based and satellite measurements span a range of integration times (3 to 30 s) and horizontal spatial scales (2 km to 40 km) which must be reconciled with the variability of the aurora in order to yield useful comparisons. Herein, we present direct comparisons of ground-based and GUVI derived key parameters in the context of the intrinsic auroral temporal and spatial variability.

**SA62B-0411 1330h POSTER**

**Validation of Global Ultraviolet Imager (GUVI) Derived Electron Density Profiles With Measurements by the EISCAT Radar**

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The Global Ultraviolet Imager (GUVI) on board NASA's Thermosphere, Ionosphere, Mesosphere, Energetic and Dynamics (TIMED) spacecraft, launched in December, 2001, is a far-ultraviolet, scanning imaging spectrograph that provides horizon-to-horizon images in five selectable wavelength intervals. GUVI auroral products include maps of the auroral oval, the characteristic energy and flux of the precipitating electrons, and ionospheric electron density profiles. We have performed several campaigns in which we operated the EISCAT radar during overpasses of the TIMED spacecraft as part of a GUVI validation effort. Other data acquired during the campaigns include dynasonde measurements and all-sky camera images. We present the results of the campaigns, focusing on the comparison between the radar measurements of the electron density profiles and the profiles derived from the GUVI instrument.

#### SA62B-0412 1330h POSTER

##### A Quantitative Image Processing Approach to GUVI Observations of the Equatorial Arcs.

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The TIMED spacecraft is currently mapping the Earth disk and limb with the Global Ultraviolet Imager (GUVI). Images are made at six different wavelengths including the optically thin OI 135.6 nm line that is excited by the recombination of O<sup>+</sup> ions at night. The intensity in these nighttime disk images is related to the total electron content of the ionosphere and density profiles can be recovered from the limb scans. Prominent in these images are UV signatures of the Equatorial Anomaly. A two dimensional model for the air glow of the nighttime arcs is created from a mixture of Gaussians and fit to the images. The model parameterizes the intensity and location of the arc and is used to study the morphology as a function of local time, season, and geomagnetic activity.

#### SA62B-0413 1330h POSTER

##### Global View of the Nighttime low Latitude Ionosphere by the 135.6 nm OI Observation with IMAGE/FUV

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The auroral camera onboard the IMAGE satellite (FUV) has been taking snapshots of Earth's atmosphere. The FUV/SI (Spectral Imager) instrument takes images at two wavelengths (121.8 nm (SI12) and 135.6 nm (SI13)). The SI13 measures 135.6 nm emissions, which is emitted by atomic oxygen, with a narrow spectral resolution of 8.0 nm. During nighttime at mid and low latitudes when emission due to particle excitation is negligible, the 135.6 nm emission originates in radiative recombination of oxygen ions and additionally from reactions involving negative oxygen ion (Dymond et. al., 1997). Therefore, the intensity of the 135.6 nm emission is a good indicator of ionospheric O<sup>+</sup> ions integrated along the line of sight. Because the latitude of IMAGE's apogee drifts toward lower latitudes, FUV is now viewing the low latitude region of the earth. In particular, the SI13 image is clearly showing the nighttime "subtropical UV arcs" corresponding to the ionospheric equatorial anomaly (EA). The two minute cadence of the observations provides a unique data set of the low-latitude nighttime ionosphere, though the instrument is more suited to making measurements of the bright aurora. The instrumental sensitivity limits the interpretation of ionospheric emissions to the area of the subtropical arcs. In this report, we present IMAGE observations of the low latitude ionosphere and compare it with the model calculation of the 135.6 nm emission rate based on the SAMI-2 ionosphere model (Huba et. al., 2000).

Acknowledgements: This work uses the SAMI2 ionosphere model written and developed by the Naval Research Laboratory.

Reference:  
Dymond, K.F., et. al., Radio Sci., 32, 1985, 1997  
Huba, J.D., et. al., JGR, 105, 23,035, 2000.

#### SA62B-0414 1330h POSTER

##### Determination of Night-side Low and Mid-latitude Electron Density Profiles From TIMED/GUVI Data

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As part of its normal operation the GUVI instrument aboard the TIMED spacecraft measures 135.6 nm emissions from the Earth's limb. We present a method of inferring electron density profiles from these GUVI data. Our method is restricted to mid and low latitude night-side regions where the dominant source of 135.6 nm emission is atomic oxygen recombination. We account for both the finite field of view and the finite field of regard of GUVI as well as other instrument artifacts. We describe here 1) the mathematical and physical underpinnings of the method, 2) the practical means of implementation, 3) an analysis of the statistical and systematic uncertainties involved in the retrievals, 4) representative electron density profiles retrieved from the GUVI measurements, 5) preliminary comparisons of these results with ionosonde station data and 6) a description of the limitations of the method and prospective areas of improvement.

#### SA62B-0415 1330h POSTER

##### Comparison of TIMED/GUVI inferred nighttime electron density with ionospheric observations and models

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The Global Ultraviolet Imager (GUVI) on NASA's Thermosphere Ionosphere and Mesosphere Energetics and Dynamics (TIMED) measures emissions of 135.6 nm on Earth's nightside limb. In this paper, we present preliminary comparisons of the inferred vertical electron density profiles (EDP) and total electron content (TEC) inferred from GUVI measurements of the 135.6 nm radiation at mid and low latitudes with that of other ionospheric measurements, including incoherent scatter radar EDP, ionosonde peak height and density, and spacebased measurements of TEC. We further compare these observations to real-time and climatological model predictions

#### SA62B-0416 1330h POSTER

##### Characterization of Low Latitude Ionospheric Plasma Depletions Using Space-Based Ultraviolet Imaging

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Modeling and characterization of ionospheric structures and dynamics are important issues in space weather research. Recently the Global Ultraviolet Imager (GUVI) on-board the Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) satellite has detected far ultraviolet (FUV) images of plasma depletions in the low latitude and equatorial ionosphere. A model of GUVI observation geometry was developed to simulate radiance observations of a model ionosphere. The model ionosphere consists of a three-dimensional array of electron densities. We investigate the assimilation of GUVI data to physics-based models. The procedure consists of iteratively adjusting the parameters of model-generated plasma depletion structures such that simulated observations result in agreement with the GUVI observations. Such assimilative comparisons provide a method for characterization of ionospheric dynamical processes from their spectroscopic signatures as observed in corresponding UV images. Furthermore, the potential for statistical inversion of GUVI radiance data to create multi-dimensional electron density profiles that can be directly compared to models is investigated.

#### SA62B-0417 1330h POSTER

##### Products Derived From GUVI Dayglow and Auroral Data

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GUVI disk imaging data in the 135.6 nm, LBH<sub>S</sub> (140 – 150 nm) and LBH<sub>L</sub> (165 – 180 nm) channels will be addressed. Dayglow data of interest are from the 135.6 nm and LBH<sub>S</sub> channels recorded under quiet geomagnetic conditions in January and March 2002. Auroral data of interest are from these channels plus the LBH<sub>L</sub> channel addressing observations in January, March, and April. Dayglow products are O/N<sub>2</sub> (column density ratio referenced to an N<sub>2</sub> column density of 10<sup>17</sup> cm<sup>-2</sup>) and Q<sub>EUUV</sub> (integrated solar flux below 45 nm). Auroral products are O/N<sub>2</sub>, E<sub>o</sub> (characteristic energy in keV for either Gaussian or Maxwellian distributions being used to characterize electron precipitation), and Q (associated energy flux in ergs cm<sup>-2</sup> s<sup>-1</sup>). The products are derived from recently developed algorithms by Strickland [2002]. The sensitivity of dayside O/N<sub>2</sub> and Q<sub>EUUV</sub> to scalings of the N<sub>2</sub> LBH cross section and the Hinteregger spectrum below 20 nm will be shown. Comparisons will also be shown between GUVI and MSIS O/N<sub>2</sub>. Q<sub>EUUV</sub> is under investigation and will be discussed in terms of a recommended scaling of the Hinteregger spectrum below 20 nm. Auroral products will be shown for observations made during weak and strong geomagnetic disturbances. Derived O/N<sub>2</sub> is significantly smaller within the auroral oval under the more highly disturbed conditions.

Strickland, D. J., Dayglow and auroral remote sensing algorithms for TIMED/GUVI, submitted to J. Geophys. Res., September, 2002.

URL: <http://www.cpi.com>

SA62B-0418 1330h POSTER

Data Visualization Tools and Techniques developed for the TIMED/GUVI Instrument

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The Global Ultraviolet Imager (GUVI) on the NASA Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) spacecraft is a far-ultraviolet, scanning imaging spectrograph.

In this paper we present some of the tools and techniques that have been developed to visualize the GUVI data. These include and interactive data browser, summary thumb images and a variety of tools for creating animations suitable for Education and Public Outreach purposes.

The tools and techniques for rapidly producing high quality animations that show GUVI data overlaid on a photo-realistic rendering of the Earth will be demonstrated, together with methods of adapting the techniques to other TIMED data sets.

URL: <http://guvi.jhuapl.edu>

SA62B-0419 1330h POSTER

Exploiting Web-Based Systems to Provide Interactive Interpretation, Access and Display of Far Ultraviolet Data from the Global Ultraviolet Imager (GUVI) on TIMED

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The Global Ultra Violet Imager (GUVI) on the NASA TIMED spacecraft obtains horizon-to-horizon images of the aurora, dayglow and nightglow to routinely produce information about the space weather environment in the Earths upper atmosphere. This information is made available as soon as possible in a comprehensive web-based data system. This poster presents our design and implementation of an integrated web-based system which provides access to the GUVI instrument data as well as visualization tools to interactively display the GUVI data products. We will demonstrate how to access the data in its various forms, what tools are available for locating the appropriate and desired data set and various forms of summary images that are available.

URL: <http://guvi.jhuapl.edu>

SA71A MCC: 270 Sunday 0830h

Microscopic Processes in Solar System Atmospheres I (joint with A, P)

Presiding: T G Slanger, SRI International; D L Huestis, SRI International

SA71A-01 0835h INVITED

Laboratory Needs and Capabilities for Solar System Science

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A concerted effort has been made in the last year to begin to compile a comprehensive list of laboratory capabilities and needs specifically targeted toward solar system research. The NASA Laboratory

Astrophysics Workshop held at NASA Ames Research Center in May 2002 provided a focus for these efforts: the solar system invited review by Dale Cruikshank and an informal working session at that meeting produced a draft list of needs and providers, a white paper for solar system science laboratory needs, and special sessions at several meetings such as this one. These materials have been distributed by email and posted on an existing laboratory web site (<http://www.lpi.usra.edu/IJW/lab.html>), and a more general web site for sharing such information is under development. This talk will give a brief overview of the solar system laboratory needs and capabilities identified in this process, with special focus on the needs for planetary atmospheres.

SA71A-02 0855h INVITED

Chemical Kinetics and Modeling the Flow of Energy in the Earth's Upper Atmosphere

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The fundamental physical difference between the radiative balance of the terrestrial mesosphere and thermosphere and that of the atmosphere below is the departure from local thermodynamic equilibrium (LTE) that occurs for all significant radiatively active gases. Under non-LTE the distribution of energy within the quantum states of these gases is no longer determined solely by collisions with other atmospheric constituents. Instead, radiative and chemical processes are competitive with collisional processes in determining the quantum state populations. In addition, the dominant collisional processes often involve atomic oxygen, a minor constituent whose abundance is virtually impossible to measure directly using satellite remote sensing techniques. The departure from LTE dramatically impacts the radiative balance of the upper atmosphere. In this talk we will review some of the major radiative cooling mechanisms of the terrestrial upper atmosphere and discuss the role chemical kinetics plays in determining the quantum state populations, the rates of radiative emission, the rates of radiative cooling, and hence the thermal structure. An illustration of these effects as dramatically demonstrated by the upper atmosphere's response to the solar storms of April 2002 will be presented.

SA71A-03 0915h

Infrared Backgrounds from Rotational Non-Equilibrium Processes in the Upper Atmosphere

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Many of the dominant features of the infrared spectrum of the mesosphere and thermosphere result from the production of radiating states of atmospheric species which are not in vibrational equilibrium with the local translational temperature. However, the analysis of high spectral resolution data collected during the CIRRIS 1A Space Shuttle and the Midcourse Space Experiment (MSX) missions showed that significant infrared spectral features of the upper atmosphere are due to states of radiating species which are not in rotational equilibrium with the local translational temperature. This paper will review the observational database collected by CIRRIS 1A and MSX on infrared emissions from highly rotationally excited OH, NO, and NO+ in the upper atmosphere. Laboratory measurements, state-to-state molecular dynamics calculations, and aeronomic models of chemical processes producing highly rotationally excited OH in the mesosphere and highly rotationally excited NO and NO+ in the thermosphere will also be reviewed. In addition, requirements for additional space-based observations, laboratory measurements, and chemical dynamical calculations of upper atmospheric rotational non-equilibrium processes will be identified.

SA71A-04 0930h

The Utility of NO 5.3 μm Radiation for Remote Sensing of Thermospheric Atomic Oxygen or Temperature

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