profiles. Instead it makes sense to compare experimental profiles with those, calculated in connection with an atmospheric model. These profiles are also "averaged" by the model of an irregular atmosphere. Such "averaged-weighted" profiles will be calculated taking into account the probing ray tracing in the model of an irregular atmosphere. If the model of the irregular atmosphere is close to the real atmosphere then the calculated model profiles will be close to experimental profiles. Such comparison of "weighted" model profiles with experimental profiles allows to compare different atmosphere models and to validate these models in data spares regions like the Arctic.

The paper discusses the methods and results of modeling the solution of the forward and inverse problems of atmosphere diagnostics. Modeling is based on comparing the given model distribution of the atmospheric parameters and the distribution obtained by solving the inverse problem by means of the occultation technique using GPS radiosignals. The data for solving the inverse problem are obtained by solving the forward problem of radiosignal propagation in a nonhomogeneous medium. The spatial 3D distribution of the refraction index for the atmosphere is produced as a result of recalculating the fields of meteorological parameters (pressure, temperature and humidity) obtained from simulations with the regional model of the Arctic atmosphere HIRHAM4 for altitudes up to 25 km. For higher altitudes the CIRA model of the atmosphere and the model distribution of the ionosphere electron density were used. The error in the forward problem solution was, as recalculated with respect to satellite position, less then 2 cm, which reduces the error in reconstructing the profiles of meteorological parameters to less than 0.1% in the case of a spherically symmetrical medium.

A distribution of the errors and biases in reconstructing meteorological parameters at the levels defined by the HIRHAM4 model for an Arctic integration area were obtained. The regions where the error are greater than the "background" ones have been determined and the positions of these regions were compared with the distribution of meteorological parameters gradients. These results allow the diagnostics of model errors and biases. The possibility of validating models using also the data from ground-based GPS receivers was established. The results of comparing the experimental profiles reconstructed by the occultation technique with those calculated for the same region using the "weighted" regional atmospheric model profiles are discussed.

URL: http://www.awi-potsdam.de

A51C-0073 0830h POSTER

The Impact of NPOESS on Mesoscale Forecasts

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Environmental Data Records (EDRs) from the future National Polar-orbiting Operational Environmental Satellite System (NPOESS) represent a significant improvement in both the quantity and quality of satellite data available to operational weather forecast centers. The availability of these EDRs potentially affects many aspects of military and civilian operations. Our objective is to assess the influence of NPOESS on the accuracy of mesoscale numerical weather prediction model forecasts over a region where conventional data are limited. This is accomplished by conducting an NPOESS Mesoscale Observing System Simulation Experiment (OSSE), in which, the observing system data is simulated by appropriate quantities derived from the results of a numerical weather prediction model that functions as the nature run. An independent forecast model is selected to make weather predictions both with and without the simulated observations. The results are compared to assess the overall impact of the new observing system.

The simulated observations in this study are based on the Mesoscale Atmospheric Simulation System (MASS). The model results pertaining to a 30-day period in 1982 over the Korean peninsula are sampled to simulate NPOESS data and soundings at World Meteorological Organization (WMO) locations. The MM5 version 3 is used to generate forecasts using National Centers for Environmental Prediction (NCEP) analyses with and without the enhancement of NPOESS simulated data. Two assimilation runs are created to produce fields enhanced by just WMO data and a combination of WMO and NPOESS data. In both cases, the simulated observations influence the calculations through the initial and boundary conditions and the four dimensional data assimilation (FDDA). These results are used to initialize 6-, 12- and 24-h forecasts that are compared to the nature run.

As expected, a comparison of the assimilation runs and nature run shows the addition of simulated NPOESS data brings the fields closer to the nature run. However, the differences between the two assimilation runs are small in comparison to the differences between the nature run and either assimilation run. When forecast accuracy is compared, the inclusion of NPOESS simulated data is shown to reduce errors in certain quantities. For example, the mid-level temperature forecasts are significantly improved for the short-term forecast period in contrast to the moisture quantities that are not improved over any period.

Ongoing research is focused on improving the nature run to remove unrealistic effects and biases. This is expected to result in greater improvements in accuracy attributable to NPOESS simulated observations. Future work involves changing the time and the location to avoid large-scale events and changing the assimilation approach to give more weight to the observations.

A51C-0074 0830h POSTER

Investigation of liquid water path retrieval techniques using ship-based microwave radiometers

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Investigation of ship-based microwave radiometer observations from the equatorial Pacific during four EPIC cruises indicates nonphysical values of liquid water path during clear sky conditions. These data are evaluated using measurements taken at the Atmospheric Radiation Measurement Program's Tropical Western Pacific (TWP) site during the Nauru99 experiment. Ship-based observations from the RV Ron Brown and the Mirai taken near the TWP site are employed for instrumentation evaluation. Liquid water path inferred by several remote-sensing instruments, ship- and island-based, are compared with each other and with values modeled from sonde data. In general, the modeled brightness temperatures from the sondes are greater than those determined by the radiometers. However, it is unclear whether this indicates a problem with the radiometer or with the aging sondes. The microwave radiometer on the RV Ron Brown compared favorably with a similar instrument located on the island. Retrieval techniques which combine radiometer data with ceilometer data are promising under clear sky or stratus cloud conditions. New techniques for retrieving liquid water path information under broken cloud conditions are being developed.

A51C-0075 0830h POSTER

In-situ Crystallization of Gypsum on a Beta-Gauge Filter

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Beta gauges are frequently used for continuous mass monitoring of ambient air particles. In the Anderson FH 62 I-R a quartz fiber particle filter is exposed to beta particles from a Kr-85 source. The absorption of beta radiation is then a measure of the mass of particles deposited on the filter. In our setup, condensation was avoided by keeping the sampling tube at 50°C , which lead to a filter temperature of 35°C. Sampling was performed through a PM1 inlet for periods of 24h at a flow rate of 1m3 per h. After sampling, the filters were analyzed using a high resolution scanning electron microscope (HR-SEM, XL30, FEG). A thorough inspection of the filter surface revealed idiomorphically shaped crystals which were identified as gypsum. The idiomorphic shape is rather unusual for airborn particles, indicating that these crystals grew on the filter surface during sampling. Two pathways may be invoked: i) reaction of atmospheric sulfur dioxide (SO_2), possibly after (surface bound) oxidation to sulfate (SO_4^{2-}), with calcareous particulate matter trapped on the filter or ii) chemical reaction between ammonium sulfate $(NH_4)_2SO_4$ and calcareous particulate matter, with or without intermediate dissolution of these substances. In both cases, the in-situ formation of gypsum on the filter surface is probably coupled to a change in mass, as well as a change in absorption of beta radiation that must be considered when interpreting results obtained by a beta gauge. Such processes may also be important for morphological studies of ambient particulate matter. Our further work will focus on the crystallization of gypsum on a filter surface using synthetic mixtures of N_2, O_2, SO_2, and H_2O to test the mentioned crystallization pathways.

A51D MC: Hall D Friday 0830h

Predictability of the North American Monsoon System II

Presiding: **K Arsenault,** NASA Goddard Space Flight Center

A

A51D-0076 0830h POSTER

Synoptic Patterns and Frequency Analysis of the North American Monsoon System

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This study investigates the hypothesis that the evolution of the North American Monsoon System (NAMS) is modulated by intraseasonal fluctuations in atmospheric circulation. The monsoon phenomenon undergoes considerable intraseasonal variability with alternating periods of widespread, heavy thunderstorms (bursts) and drier periods (breaks). The monsoon bursts (breaks) occur on time scales of days (weeks) and appear to be modulated by synoptic patterns that help organize convectively favorable (unfavorable) environments. For this two-part investigation, we first analyze composite synoptic pressure patterns and identify atmospheric configurations that enhance or stifle convective activity. Precipitation data from stations in Arizona and New Mexico are ranked by total July-August precipitation (1958-1998) to identify monsoon seasons by strength. Significant precipitation events are chosen from high/low monsoon seasons. The NCEP-NCAR Reanalysis Data are used to identify regional atmospheric features preceding and following each of the significant events. We examine the 500 mb geopotential height, focusing on midlatitude upper level trough features, easterly flow from the Gulf of Mexico, moisture surges from the Gulf of California, and latitudinal position of the Bermuda and Pacific Subtropical Highs. Secondly, intraseasonal fluctuations of observed summer precipitation for Arizona and New Mexico are analyzed to ascertain their spatial/temporal coherence. Spectral characteristics of intraseasonal burst/break activity are examined using a 41-year data set of July- August average daily precipitation for regions in Arizona and New Mexico. Wavelet analysis is used to explore both the dominant modes of variability and how those modes vary in time. This work represents a step in a broader investigation that will examine interactions between the land surface and atmospheric circulation as they relate to the North American Monsoon System. Further analysis will examine comparison to indices of large-scale atmospheric features i,e., ENSO, PNA, and MJO, and possible land surface forcing of anomalous snow extent over North America.

A51D-0077 0830h POSTER

Effects of a Revised Cumulus Parameterization Scheme on CCM3 Simulations of the North American Monsoon

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Monsoon circulations involve feedback between atmospheric dynamics and diabatic heating. We thus expect that simulations of the North American monsoon in a GCM could be affected by details of the convective parameterization. CCM3 version 3.6.16 is being run for the AMIP-II period (1979-1996) using identical configurations except for the cumulus parameterization. A simulation with the original Zhang and McFarlane scheme is compared to a revised version in which the closure responds to large-scale forcing rather than being determined exclusively by boundary-layer CAPE. Simulated precipitation over the North American monsoon region shows monsoon-like signals in some years but not in others. When the monsoon-like signal does occur, onset of precipitation is about a month earlier

in CCM3 than typically observed. There is not a consistent difference between the two cumulus parameterizations in terms of monsoon precipitation, in that for a given year a clearer monsoon signal may appear either in the original scheme or in the revised scheme.

A51D-0078 0830h POSTER

Investigation of cold land surface processes - summer monsoon interaction in North America

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The study of cold land process and its interaction with atmosphere is an important scientific subject. To understand this process, we first analyze the relationship between snow, summer precipitation, and surface temperature over the North American continent. The precipitation data (Xie and Arkin) and surface temperature data (Halpert, NCEP) from 1980 through 1999 are used for the analyses. It is found that heavy snow in North-West US and adjacent Canadian area during the winter season correlate with cold spring temperatures in the western US, and relatively weak summer precipitation in the eastern US.

Modeling study is conducted to test this relationship and elucidate mechanisms that cause this correlation. At the first step, we test the impact of deep soil temperature in the western US during the late spring on the summer US precipitation. A newly developed coupled regional climate model, the Eta/SSiB model, is used for this study. The model is integrated for three months from May 1, 1998 through July 31, 1998 with two different initial deep soil temperatures over the western US, one corresponds with warm years and the other corresponds with cold years. Each case consists of five different initial atmospheric conditions. The ensemble means are taken for analyses. The experiments with warm initial deep soil temperature in the western US produce stronger monthly mean precipitation over the southern U.S. Meanwhile, precipitation is reduced to the north. The impact mainly occurs in June. The temperature anomalies induce the variations in wind field, which in turn change the amount of moisture flowing into the continent, resulting in the change in rainfall.

In addition, different initial deep soil anomalies are also specified to test the model response. In one experiment, deep soil temperature anomalies that are greater than the previous experiment are specified, which produces a much larger anomalies in precipitation. In another experiment, observed May deep soil temperature anomalies between 1992 (a warm year) and 1998 (a cold year) are specified in the Eta model. The simulated precipitation anomalies patterns are not only consistent with the above-mentioned experiments, but are also closer to the observed precipitation difference between 1998 and 1982. Meanwhile, the impact of domain size is also tested.

This preliminary study indicates that deep soil temperature over the western U.S. in late spring has impact on the summer U.S. precipitation, which could have a substantial implication for the North American snow-monsoon interactions.

A51D-0079 0830h POSTER

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In this study, the effects of soil moisture conditions on interannual variability of the water balance over the North American monsoon (NAM) region was investigated using NCAR's MM5/OSU model. Observations and modeling studies suggest that a positive soil moisture-rainfall feedback may be important in magnifying and prolonging hydroclimatic anomalies in a variety of regions. Our preliminary modeling experiments show that the soil moisture-rainfall feedback is strong in the North American Monsoon System (NAMS) region and may contribute to variability of summertime precipitation in this area. However, this result is based on sensitivity experiments using extreme forcing - soil moisture was held at field capacity or wilting point throughout season long simulations. Here we use the MM5 model linked to the OSU land surface scheme to assess the strength of soil moisture-rainfall feedbacks in the NAMS region that result from realistic soil moisture forcing. Simulations are driven by NCEP reanalysis. The horizontal resolution of the finest grid is 30 km. Three member ensemble experiments begin on June 1 and end on October 1. First, we use the coupled MM5/OSU model to simulate NAMS climate and soil moisture in wet (1999) and dry (2000) monsoon seasons. Second, we repeat these two experiments but constrain the precipitation rate in July over the entire NAM region so that it approximates the mean state. This is accomplished by scaling the simulated precipitation at each point so that it is equal to mean observed precipitation at that location. Third, we repeat the 1999 and 2000 experiments but constrain the soil moisture field in July to the climatological mean value from the NCEP reanalysis. Both types of sensitivity experiments preserve the temporal variability of sea surface temperature (SST) in the surrounding oceans. We compare the atmosphere and land surface state in the control and sensitivity experiments. This isolates the effects of soil moisture anomalies on the water balance over the NAM region in both a dry and a wet year. The results show that the simulated water balance is not only controlled by land-atmosphere interactions, but is also affected by surface hydrological processes. The partitioning of rainfall between runoff and evapotranspiration is particularly important. The behavior of the rainfall-soil moisture feedback over the NAM region is closely related to the intensity of soil moisture anomalies. Soil moisture anomalies, and their effects on rainfall, persist for roughly one month, and therefore can enhance predictions at this timescale.

A51D-0080 0830h POSTER

Exploring the Interaction of the North American Monsoon and Land Surface Dynamics

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The predictability of the relationship between the land surface states and precipitation patterns over the continental U.S. is investigated within the context of the North American Monsoon System (NAMS). The NAMS undergoes intraseasonal and interannual variability that is modified by land surface interaction. This relationship is explored using a recently developed high temporal and spatial resolution dataset that consists of a combination of observed and modeled land surface information. This land surface data set is generated as part of our collaboration with the Land Data Assimilation System (LDAS), which is an 1/8° hourly resolution dataset based largely on a highly observation-constrained Mosaic Land Surface Model (LSM) simulation. The precipitation data, used as forcing by the LSM, is derived from a merging of ETA model, hourly StageIV Doppler radar, and daily rain gauge precipitation products which do include some observations from Mexico. A short-term (1996-current) retrospective LDAS simulation is used for this study along with other longer timeseries of observational and model data. A cross correlation study is performed between summer precipitation and different hydrological and surface variables for various regions in the U.S. These different regions are defined by geographic location and summer precipitation climatologies. From June to July, a significant shift in precipitation occurs over North America which affects the amount of soil moisture content in the Southwest and thus latent heat and other surface fluxes during the rest of summer. The role of the soil moisture and surface flux variability in the NAMS regions can act to feedback onto the atmosphere locally but possibly in downstream areas as well.

URL: http://ldas.gsfc.nasa.gov/

A51D-0081 0830h POSTER

Modeling the Impact of Winter Snow Cover on the North American Monsoon

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Previous work by us using the NCAR CCM3 suggests a fair degree of predictability in snow cover over the western U.S. That is, the extent of snow cover in mid to late winter plays a major role in determining the extent of snow cover through spring. These results also suggest possible implications for lagged downstream and interseasonal effects on the climate outside the immediate snow-covered area. In particular, previous studies by others suggest a possible connection between ENSO, anomalies in North American snow cover, and the North American monsoon (NAM). We have extended our CCM3 work to investigate the impact of snow anomalies on the NAM. As is true of many GCMs, CCM3 does not give a very good simulation of the spatial patterns and timing of the NAM; in particular, the monsoonal precipitation tends to occur too far east and north. This is true even in a run forced with observed month-to-month sea surface temperatures. Nevertheless, possible linkages can still be explored in a mechanistic fashion by examining the impact of snow cover anomalies on those locations in the model where the NAM does occur (which will in general be different from the true locations of the NAM). Preliminary results show that enhanced snow cover in late winter and spring does tend to reduce precipitation over the modeled NAM region the following summer, but variability is also large, making difficult any determination of statistical significance.

A51D-0082 0830h POSTER

The Role of the Indian Ocean Dipole in Weakening of the Relationship Between the Indian Monsoon Rainfall and ENSO

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The influence of the recently discovered Indian Ocean Dipole (IOD) on the interannual variability of the Indian summer monsoon rainfall (ISMR) has been investigated for the period 1958-1997. The IOD and the El Nio/Southern Oscillation (ENSO) have complementarily affected the ISMR during the last four decades. Whenever the ENSO-ISMR correlation is low (high), the IOD-ISMR correlation is high (low). This paper has shown that the Indian Ocean Dipole is the cause behind the recent decline in the ENSO-Indian Summer Monsoon Rainfall (ISMR) correlation. We have discovered that the ENSO-induced anomalous circulation over the Indian region is either countered or supported by the IOD-induced anomalous meridional circulation cell, depending upon the phase and amplitude of the two major tropical phenomena in the Indo-Pacific sector.

A51D-0083 0830h POSTER

Influence of Vegetation Anomalies on the predictability of the North American Monsoon System, using Remotely Sensed Data and MM5-OSU LSM coupled model

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In the Southwestern US And Western Mexico, land-surface variables drastically change season-to-season as we as year-to-year due to the summertime monsoonal precipitation, which is curretnly called North American Monsoon System (NAMS). The state of land-surface variables shows a dramatic cycle corresponding to the monsoon cycle. Our preliminary result of remote sensing show the robust relationship between Normalized Difference Vegetation Index (NDVI) and 3 4-month mean precipitation in the NAMS, as a function of time and space. This result suggest that the there is a significant moisture feedback to the Planetary Boundary Layer (PBL), which may contribute to the interannual variabilies of the NAMS.

We employ MM5 coupled with OSU land-surface model to test the influence of interannual anomalies and seasonal growth of vegetation on the NAMS. Ensemble simulation of fixed-vegetation and dynamic-vegetation schema as well as interannual difference of

initial vegetation condition are carefully compared to investigate the difference of energy and moisture flux between the land and atmosphere. In this case, newly-generated vegetation fraction data from Goddard Space Flight Center (GSFC) Advance Very High Resolution Radiometer (AVHRR) NDVI from 1982 to 2000 is incorporated into the land surface parameterization of the MM5-OSU model. Preliminary control simulations, using fixed vegetation fraction through June-September, are compared with other simulations, using time-varying vegetation fraction. In this study time-varying vegetation fraction only change evapotrasnpiration rate. Other vegetation-related parameters, e.g., albedo, moisture contents, emissivity, and thermal inertia, are fixed through simulations. Therefore the resulting comaprison between fixed and time-varying vegetation fractionthis can portray the influence of evapotrasnpiration on the NAMS.

A51E MC: Hall D Friday 0830h

The Upper Atmosphere Research Satellite: Ten Years in Orbit II

Presiding: **C H Jackman,** NASA Goddard Space Flight Center**; A R Douglass,** NASA Goddard Space Flight Center

A51E-0084 0830h POSTER

ACRIM II and III Data Available from the Atmospheric Sciences Data Center

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The Active Cavity Radiometer Irradiance Monitor (ACRIM) II flew on board the Upper Atmosphere Research Satellite (UARS). ACRIM III was launched in 1999 on ACRIMSAT. Some of the goals of ACRIM are to monitor variability of total solar irradiance (TSI) including solar cycles and sunspots and analyze relationships between TSI and climate change. ACRIM II and III data are available from the NASA Langley Atmospheric Sciences Data Center (ASDC). ACRIM II data are available for October 1991 through August 1997. ACRIM III data are available from April 2000 through the present. These data may be obtained from the NASA Langley ASDC at http://eosweb.larc.nasa.gov.

URL: http://eosweb.larc.nasa.gov

A51E-0085 0830h POSTER

SORCE - Continuing Measurements of Solar Irradiance

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The NASA/EOS Solar Radiation and Climate Experiment (SORCE) will measure the total and the spectral irradiance from the Sun, continuing the solar data record from the Upper Atmosphere Research Satellite (UARS). Four SORCE instruments provide irradiance measurements at wavelengths from 1 nm to longer than 2000 nm. The Total Irradiance Monitor (TIM) measures total solar irradiance (TSI), similar to the UARS/ACRIM instrument. The TIM will achieve a relative standard uncertainty (1 σ precision) of 100 parts per million (ppm), continuing the 23-year record of TSI measurements. SORCE's two SOLar STellar Irradiance Comparison Experiment (SOLSTICE) instruments are nearly identical to the SOLSTICE flown on UARS. These grating spectrometers monitor the more highly-variable solar ultraviolet irradiance over the wavelength range 120 to 300 nm with a 2 to 5% absolute uncertainty and a capability of making relative solar variability measurements with an accuracy of 0.5% by using stable, blue stars for in-flight calibration. The Spectral Irradiance Monitor (SIM) is a new prism spectrometer providing the first continuous solar spectral irradiance measurements from 200 to 2000 nm with 300 ppm uncertainty. The XUV Photometer System (XPS) covers 1 to 35 nm using 9 spectral bandpass filters to measure the large solar irradiance variations in the extreme ultraviolet with a ~20% accuracy.

Launching in July of 2002 with a mission life goal of 5 years, SORCE will extend the UARS solar irradiance database in time as well as spectral region. SORCE data will be available via NASA/GSFC's Distributed Active Archive Center (DAAC) as well as from LASP's web site (http://lasp.colorado.edu/sorce).

URL: http://lasp.colorado.edu/sorce/

A51E-0086 0830h POSTER

Multi-Decade Long Total Solar Irradiance Measurements

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Total solar irradiance has been measured from space for more than two decades by various instruments. These irradiance observations demonstrate that total irradiance changes on time scales from minutes to decades. While studying short-term irradiance variations are important for solar physics, establishing the amplitude of irradiance variations within a particular solar cycle and from one cycle to another is important also for climate studies. The composite total irradiance, compiled from various time series, indicates that the amplitude of total irradiance is about the same during the minima and maxima of solar cycles 21, 22, and 23 within the measuring uncertainties. Since the ACRIM time series provides the longest data set in the composite total irradiance, the ACRIM data are compared to the measurements of the Nimbus-7/ERB, ERBS and SOHO/VIRGO total irradiance using various processings of the UARS/ACRIM II measurements.

A51E-0087 0830h POSTER

Solar UV Spectral Irradiance Variation During Solar Cycle 23

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The Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) aboard the UARS has measured the solar spectral irradiance at UV wavelengths in the 115-410 nm range since October 1991. This period extends from a secondary maximum of solar activity before the decline of solar cycle 22, through the intervening solar minimum, and through the solar cycle 23 maximum. Accordingly, SUSIM has observed nearly the entire UV variation of both solar cycles. SUSIM uses deuterium lamps and redundant optical channels to determine changes in its responsivity since its final ground calibration more than ten years before the latest measurements. The new results for the wavelength-dependent variation of the solar UV spectral irradiance during solar cycle 23 will be presented. Trends in solar irradiance and in possible error sources are identified and analyzed. Emphasis will be placed on comparisons with variations observed during solar cycle 22 and on their relationship with solar indices (such as the MgII core-to-wing ratio). The rationale for continuing redundant and overlapping measurements of the solar UV irradiance will be provided.

URL: http://wwwsolar.nrl.navy.mil/susim_uars.html

A51E-0088 0830h POSTER

Global Distribution of Stratospheric NO2 Retrieved from UARS/CLAES Limb Radiance Measurements

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The Cryogenic Limb Array Etalon Spectrometer (CLAES) aboard the Upper Atmospheric Research Satellite (UARS) has made extensive measurements of thermal infrared emission from Earths Limb during the period of Sept. 1991 to May 1993. We describe the development and application of a maximum likelihood retrieval algorithm to the UARS/CLAES Blocker-3 6.23 micron radiance measurements.These data provide the first near-global diurnal view of stratospheric NO2 since the 1979 LIMS instrument. We also discuss data quality through an analysis of estimated uncertainties,and biases resulting from our retrieval algorithm, comparison with correlative NO2 measurements and an examination of known limitations.

A51E-0089 0830h POSTER

A Comparison of HALOE/UARS Derived Methane Profiles With Balloon Measurements

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Measurements of various minor constituents from a tropical location in India (Hyderabad; 17.5N, 78.6E) has been started 1987 using the balloon-borne cryosampler technique and gas chromatography based laboratory analysis. In the period of 1987 to 1998, four balloon flights have been conducted on (1) March 27, 1987, (2) April 9, 1990, (3) April 16, 1994, and (4) April 18, 1998. The vertical distribution of CH_4 are constructed in the altitude range of about 8 to 37 km by GC-FID analysis and calibrated against the Linde/NIST calibration gases. The 1987, 1994 and 1998 profiles are overall in agreement (except a small kink) with each other as well as with the MPIC 2D model simulations, whereas that for 1990 deviates significantly in 25-32 km altitude range.

We have estimated the HALOE CH_4 vertical profiles by averaging all the available data between 16^0N-19^0 latitude in March-April of every year. To obtain values at particular altitude the HALOE profiles (Level 2 data, SPF formatted) were first interpolated. The basic characteristics of the CH_4 profiles from balloon-borne and HALOE measurements are fairly in agreement on overlapping time period.

It is also apparent from the HALOE data that the interannual variations of CH_4 at most stratospheric altitude has the strong stratospheric QBO signal. Satellite data show that in the easterly phase of QBO the enhanced mixing rate near the sub-tropical 'surf' zone lower the CH_4 concentration around 30 km, where the QBO intensity peaks. This was the situation in March-April 1990 and 1997. Thus the 1990 balloon profile closely matches with the 1997 HALOE CH_4. However, it should be pointed out that the satellite based vertical profiles are rather smooth compared to the in-situ observations. This smoothing could be caused by the algorithm used in the vertical profile estimation from the radiation spectra.

Detailed results and features will be discussed during the presentation.

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Chemical Ozone Loss and Chlorine Activation Deduced From HALOE and OMS Measurements in Arctic Winter 1999-2000

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