East Tennessee Ozone Study 2006 Science Workshop

Detailed Program Agenda

Pollard Technology Conference Center
May 17 - 18, 2006
Oak Ridge, TN

WELCOME

May 17, 2006

Greetings,

I welcome you to the East Tennessee Ozone Study (ETOS) 2006 Science Workshop. The Workshop is sponsored by the National Oceanic and Atmospheric Administration (NOAA) and provides an opportunity for regional stakeholders to discuss current topics in air quality. Over the next two days, we will showcase some of the exciting research taking place within our region. The opening session features remarks by Dr. Richard Spinrad, Assistant Administrator of the NOAA/Office of Oceanic and Atmospheric Research, and by staffers from the offices of our Congressional representatives. The plenary and technical sessions of the first day focus on the measurement, modeling, and forecasting of atmospheric ozone while the second day's sessions concentrate on measurement and modeling of particulate matter. The science and policy dealing with ozone and particulate matter have taken prominent positions in the local media over the last few years due to federal air quality regulations. One of the goals of the Workshop is to provide a forum for the discussion of the impact of atmospheric research and policy on the citizens of our region and their environment.

Another exciting aspect of the Workshop is the Air Quality Poster Session and "Taste of Tennessee" Evening Reception. Professionals and students will have posters of their research on display during the reception. The poster session gives us the opportunity to engage the participants in dialogue about their work while enjoying entertainment by Wild Blue Yonder Band and catering by Buddy's Bar-B-Q. You will notice that the reception theme, "Taste of Tennessee", is evident throughout the Workshop. From the entertainment to the meals, the Workshop features some of the best that East Tennessee has to offer.

I hope that each of you has a successful and profitable experience during the Workshop. Thank you for your participation.

Sincerely,

LaToya Myles, Ph.D.
ETOS 2006 Science Workshop Coordinator

Wednesday, May 17, 2006

7:30 am to 8:30 am **Registration and Continental Breakfast**

8:30 am to 9:00 am **Opening Session**

Moderator: Rayford P. Hosker, Director, NOAA/ARL/Atmospheric Turbulence & Diffusion Division

Opening Remarks

Carolyn Carter Jensen, Senior Field Representative, Office of Senator Bill Frist
Gina Broome, District Representative, Congressman Zach Wamp
Jonathan Griswold, Legislative Assistant, Office of Congressman John J. Duncan
Richard Spinrad, Assistant Administrator, NOAA/Office of Oceanic and Atmospheric Research
Richard Artz, Acting Director, NOAA/Air Resources Laboratory

9:00 am to 10:00 am **Plenary Session I: Ozone in East Tennessee**

9:00 am - 9:30 am

Policy and Science: Assessing the Impact of Regulations on Air Quality and Human Health

Valerie Garcia, Deputy Director, Joint NOAA/EPA Atmospheric Sciences Modeling Division

9:30 am - 10:00 am

Ozone Formation - Is All NO_x Created Equal?

Jim Meagher, Acting Deputy Director, NOAA/ESRL Chemical Sciences Division and Manager of NOAA's Air Quality Program

10:00 am to 10:20 am **Coffee Break**

10:20 am to 12:00 pm **Technical Session I: Measurement and Monitoring of Ozone**

Moderator: William J. Parkhurst, Tennessee Valley Authority

10:20 am - 10:40 am

An Overview of the East Tennessee Ozone Study

William R. Pendergrass, NOAA/ARL/ Atmospheric Turbulence & Diffusion Division

10:40 am - 11:00 am

Analysis of Similarities and Differences in the Causes of High Ozone Between the Knoxville and Great Smoky Mountains National Park Monitoring Sites

Sharon Douglas, ICF Consulting

2006 Science Workshop Agenda

11:00 am - 11:20 am
Environment and Health: Assessing the Link
Micky Roberts, Tennessee Dept of Health/Blount County Health Department

11:20 am - 11:40 am
Ozone Profiles in the Non-Stationary PBL Over Eastern Tennessee
Carmen J. Nappo, CJN Research Meteorology

11:40 am - 12:00 pm
Tennessee Ozone Trends
Cassandra Wylie, Tennessee Valley Authority

12:00 pm to 1:00 pm **Lunch (cash & carry provided by Buddy's Bar·B·Q)**

1:00 pm to 2:20 pm **Technical Session II: Modeling & Forecasting Ozone**
Moderator: Mike Goldstein, Memphis/Shelby County Health Department

1:00 pm -1:20 pm
A Statistical Model for Ozone Forecasting
Greg Goodrich, Western Kentucky University

1:20 pm - 1:40 pm
The NOAA-EPA National Air Quality Forecasting System
Jerold Herwehe, NOAA/ARL/Atmospheric Sciences Modeling Division

1:40 pm - 2:00 pm
NARSTO Support for Atmospheric Science Research and Data Collection Endeavors
Les Hook, ORNL - Environmental Sciences Division

2:00 pm - 2:20 pm
Cooperative Forecasting - TVA and MSCHD
Mike Goldstein, Memphis and Shelby County Health Department

2:20 pm to 2:40 pm **Break**

2:40 pm to 3:00 pm **Future Directions**
Panel discussion with technical session moderators. Overview of the day's presentations and a look to the future.

5:30 pm to 7:30 pm **Air Quality Poster Session and "Taste of Tennessee" Evening Reception**
Entertainment provided by Wild Blue Yonder Band
Refreshments provided by Buddy's Bar·B·Q

Thursday, May 18, 2006

7:30 am to 8:30 am **Registration and Continental Breakfast**

8:30 am to 9:30 am **Plenary Session II - Particulate Matter (PM) in East Tennessee**
Moderator: Tilden P. Meyers, Deputy Director, NOAA/ARL/Atmospheric Turbulence & Diffusion Division

8:30 am - 9:00 am
Policy/Regulatory Issues Regarding PM 2.5
Quincy Styke, III, Deputy Director, Division of Air Pollution Control, TDEC

9:00 am - 9:30 am
Particulate Matter Monitoring and Modeling in the Southeastern US
Pat Brewer, VISTAS Technical Coordinator

9:30 am to 9:50 am **Coffee Break**

9:50 am to 11:50 am **Technical Session III: Measurement and Monitoring of Particulate Matter, Haze, and Deposition**
Moderator: Roger Tanner, Tennessee Valley Authority

9:50 am - 10:10 am
Dry Deposition -- Some Recent Developments
Bruce Hicks, METCORPS

10:10 am - 10:30 am
Diurnal Variation in Aerosol Chemical Composition from Reconstructed Fine Mass
Roger Tanner, Tennessee Valley Authority

10:30 am - 10:50 am
Adopting CARB
Carmen DeLong

10:50 am - 11:10 am
Overview of the Air Quality Monitoring and Research Program at Great Smoky Mountains National Park
Jim Renfro, National Park Service, Great Smoky Mountains National Park

11:10 am - 11:30 am
Seasonal Distribution and Modeling of Diesel Particulate Matter in the Southeast US
Joshua Fu, University of Tennessee

2006 Science Workshop Agenda

11:30 am - 11:50 am
A Re-Examination of Models for Computing the Deposition of PM 2.5 Sulfate and Nitrate
Tilden Meyers, NOAA/ARL/ Atmospheric Turbulence & Diffusion Division

11:50 am to 1:00 pm **Lunch (cash & carry provided by Buddy's Bar·B·Q)**

1:00 pm to 2:00 pm **Technical Session IV: Measurement and Modeling Particulate Matter**
Moderator: Kathy Jones, Chattanooga-Hamilton County Air Pollution Control

1:00 pm - 1:20 pm
Contaminant Transport in an Urban Environment
Stephen Nichols, UT SimCenter at Chattanooga

1:20 pm - 1:40 pm
Montgomery County PM 2.5 Episodes
William J. Parkhurst, Tennessee Valley Authority

1:40 pm - 2:00 pm
Comments About EPA's new Exceptional Event Proposed Rule
Kathy Jones, Chattanooga-Hamilton County Air Pollution Control

2:00 pm to 2:20 pm **Future Directions & Closing Remarks**
Panel discussion with technical session moderators. Overview of the day's presentations and a look to the future.

Plenary Speaker Biographical Sketches

Valerie Garcia has 20 years experience in policy, resource planning, and management of scientific programs. She earned her Bachelor of Science degree in Information Technology at San Francisco University. She received her Masters Degree from North Carolina State University and is now actively pursuing her Ph.D. She has a broad background, working in the Office of Science Policy, and Resources Planning and Execution Staff, in the EPA's Office of Research and Development Headquarters. She served as the Lead Assistant Lab Director for the National Exposure Research Lab in EPA's Office of Research and Development, and is currently the Deputy Director for the joint EPA/NOAA Atmospheric Sciences Modeling Division in Research Triangle Park, North Carolina.

Jim Meagher earned a B.Sc. in Chemistry from St. Francis Xavier University and a Ph.D. in Physical Chemistry from The Catholic University of America. Jim served in post-doctoral appointments at both The University of Washington and Pennsylvania State University. He previously held the position of Manager of the Atmospheric Sciences Division of the Tennessee Valley Authority Environmental Research Center in Muscle Shoals Alabama. Jim currently serves as the Acting Deputy Director of the Chemical Sciences Division of the NOAA/OAR/Earth Systems Research Laboratory (formerly Aeronomony Laboratory) and Manager of NOAA's Air Quality Program.

Quincy N. Styke, III holds a B.S. in Biology from Middle Tennessee State University and a Master of Public Health in Industrial Hygiene from the University of Tennessee at Knoxville. Quincy has served on the U.S. EPA Common Sense Initiative for the automotive manufacturing sector, the Policy Committee of the Southern Appalachian Mountains Initiative, and the Planning Committee of the Visibility Improvement State and Tribal Association of the Southeast (VISTAS). He currently serves as the Deputy Director of the State of Tennessee - Division of Air Pollution Control in Nashville.

Pat Brewer serves as Technical Coordinator of VISTAS and SESARM, which are responsible for the technical analyses and regional coordination to support state implementation plans for the regional haze rule and the ozone and fine particulate matter standards. In her position, Ms. Brewer is responsible for managing the monitoring, data analyses, emissions inventory, and air quality modeling to support state regulatory decisions. Ms Brewer has 25 years experience in atmospheric science and forest effects of acid deposition and ozone. She served as Technical Coordinator for the Southern Appalachian Mountains Initiative from 1997 to 2002 and led the integrated assessment of ozone, acid deposition and visibility effects in the Southern Appalachians.

ABSTRACTS

Plenary Session I: Ozone in East Tennessee

Moderator: Carmen J. Nappo, CJN Research Meteorology

Valerie Garcia, Deputy Director, Joint NOAA/EPA Atmospheric Sciences Modeling Division

Wednesday, May 17, 2006, 9:00 am - 9:30 am

Policy and Science: Assessing the Impact of Regulations on Air Quality and Human Health

The transport of ozone and its precursors across state boundaries has impacted the ability of some states in the eastern United States to attain compliance with ozone thresholds established by the National Ambient Air Quality Standards (NAAQS). Nitrogen oxide emissions from electrical generating units in the Ohio Valley photochemically react to form ozone downwind of the source region. Synoptic weather patterns carry the pollutants farther downwind, and in some cases, impact air quality hundreds of kilometers away. The NOx SIP call was recently implemented to reduce NOx emissions, and therefore, the generation of ozone and the transport of both pollutants across state boundaries. This presentation will discuss the NOx SIP call and the results of several studies investigating the impact of the regulation on NOx emissions and ozone levels across the northeastern United States. Current research plans to investigate linkages with human health will also be discussed.

Disclaimer: The research presented here was performed under the Memorandum of Understanding between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) and under agreement number DW13921548. This work constitutes a contribution to the NOAA Air Quality Program. Although it has been reviewed by EPA and NOAA and approved for publication, it does not necessarily reflect their policies or views.

James F. Meagher, Acting Deputy Director, NOAA/ESRL Chemical Sciences Division and Manager of NOAA's Air Quality Program

Wednesday, May 17, 2006, 9:30 am - 10:00 am

Ozone Formation - Is All NO_x Created Equal?

The presentation will provide an overview of more than a decade of NOAA research related to the role of NO_X in regional ozone formation. Results from major field studies conducted in the Southeast (Nashville), Texas (Houston), and the Northeast will be described. These studies provided new insights into the factors that affect ozone production efficiency with a focus on NO_X emission rate, source location, pollution co-emission (e.g. VOCs and SO_2), and time of day. Ozone production, and, in some cases, loss, was found to be strongly depended on these factors, which must be considered if we are to develop effective environmental policies and efficient management strategies. The presentation will conclude with a brief discussion of remaining information gaps relative to ozone formation and distribution that need to be addressed.

ABSTRACTS

Technical Session I: Measurement and Monitoring of Ozone

Moderator: William J. Parkhurst, Tennessee Valley Authority

William R. Pendergrass, NOAA/ARL/ Atmospheric Turbulence & Diffusion Division
Wednesday, May 17, 2006, 10:20 am - 10:40 am

An Overview of the East Tennessee Ozone Study

During the summers of 1998 and 1999, air monitoring stations in Great Smoky Mountains National Park showed record eight-hour average ozone exposures, as well as record numbers of days exceeding the new EPA 8-hour ozone standard. While these elevated ozone readings impacted the Great Smoky Mountains, the high concentrations seen within the nearby East Tennessee Valley also began to focus public attention on the adverse economic and societal consequences of exceeding the new regulations.

The National Oceanic and Atmospheric Administration's Atmospheric Turbulence and Diffusion Division in Oak Ridge, TN, began a measurement and prediction program (ETOS) to develop an air-quality forecasting system for East Tennessee. With the 2003 implementation of a joint NOAA /EPA national air quality forecast initiative, the ETOS regional network also provides a means of testing the new predictive modeling system. Current ETOS partners include National Weather Service, University of Tennessee, National Park Service, and State and local air quality experts. Besides supporting air quality forecasts, the data will also help address a key question: will local air quality control measures succeed in reducing local ozone concentrations, or must changes be made on a much broader scale?

ETOS (East Tennessee Ozone Study) is a multi-year effort. It has grown from limited scoping and feasibility studies to a measurement and analysis program providing a regional database showing time and space variations in ozone concentrations across the region, and has recently expanded its focus to include particulate materials. ETOS plans are reviewed and refined each year using previous years' analyses and experience.

Sharon Douglas, ICF Consulting
Wednesday, May 17, 2006, 10:40 am - 11:00 am

Analysis of Similarities and Differences in the Causes of High Ozone Between the Knoxville and Great Smoky Mountains National Park Monitoring Sites

We have used a variety of methods to explore the similarities and differences among the lower- and higher-elevation ozone monitoring sites located within the Knoxville/Great Smoky Mountains (GSM) nonattainment area. Key issues include:

• Do high ozone concentrations occur at the lower- and higher-elevation sites on the same days? Under the same meteorological conditions?

• What are the mechanisms contributing to high ozone?

• Will emission-reduction strategies designed to address 8-hour ozone non-attainment issues for Knoxville also be effective in reducing ozone concentrations at the GSM sites?

ABSTRACTS

A highlight of this study is the use of the Ozone and Precursor Tagging Methodology (OPTM) feature of the UAM-V modeling system to examine the mechanisms influencing ozone in the areas of interest. OPTM was used to estimate the contribution of NOx and VOC emissions from five source regions to simulated ozone concentrations in the Knoxville and GSM areas for a 2009 future-year simulation.

The modeling results indicate that the relative contribution of emissions from different source regions is different for combined Knoxville/GSM exceedance days and GSM-only exceedance days. On certain days the GSM sites are potentially influenced by transport from different source areas (Kentucky, Virginia, West Virginia, North Carolina) than the Knoxville area sites (Tennessee, Alabama, Georgia). This finding is consistent with a broader range of wind directions for exceedance days at the GSM sites, and southerly to westerly winds for Knoxville exceedance days and southwesterly to northeasterly for GSM exceedance days. The results of this analysis have implications for 8-hour ozone attainment strategies.

Micky Roberts, Tennessee Dept of Health/Blount County Health Deptartment
Wednesday, May 17, 2006, 11:00 am - 11:20 am

Environment and Health: Assessing the Link

In 2002 the Blount County Environmental Health Action Team (EHAT), a diverse group of approximately 35 volunteers facilitated by professionals from the Tennessee Department of Health, was formed to address environmental issues of health. A $20,000 National Demonstration Grant was awarded from the National Association of County and City Health Officials (NACCHO) and the Centers for Disease Control and Prevention (CDC) to support activities following the Protocol for Assessing Community Excellence in Environmental Health (PACE EH). The second year replication was funded by local organizations and businesses.

After reviewing outdoor air quality data, provided by partners from the National Park Service (NPS), the Tennessee Valley Authority (TVA) and the Tennessee Department of Environment and Conservation (TDEC), the question was asked: What is ozone exposure in other areas of Blount County, where most people live, work, and play? As a result, passive ozone was monitored in seven sites with Ogawa Ozone Samplers from May 11-September 14, 2004, and replicated in 2005. Collaboration among trained volunteers, the NPS, and the Research Triangle Institute along with others allowed comparisons to be made with the Great Smoky Mountains National Park (GSMNP) 24/7 ozone monitoring. Passive ozone concentrations were specific for each monitor location but mirrored the GSMNP changes in ozone. Data have been collected on local asthma and COPD diagnoses. Community education about the Air Quality Index (AQI) for ozone utilized local media. Forecasting Ozone Action Days promoted pro-active steps to avoid the health effects of poor air quality.

ABSTRACTS

Carmen J. Nappo, CJN Research Meteorology
Wednesday, May 17, 2006, 11:20 am - 11:40 am

Ozone Profiles in the Non-Stationary PBL Over Eastern Tennessee

PBL ozone concentrations are often estimated from measurements made near the ground; however, observations show that PBL ozone concentrations almost always increase with distance from the ground surface which is a sink for ozone through surface deposition. The use of surface concentrations to infer PBL ozone concentrations can have serious consequences in model development and verification. In addition to vertical distributions of ozone, one must also consider the temporal variations. Ozone concentrations change in time due to transport and chemical transformation. Transport includes horizontal advection and vertical mixing. Chemical transformations include deposition and photochemical production. Sudden increases in surface layer ozone concentrations at night can be brought about by the intermittent breakdown of the nocturnal PBL and enhanced vertical mixing. In the developing convective PBL, ozone concentration increases are due mostly to vertical mixing from above. Over complex terrain ozone concentrations are strongly influenced by thermally-driven wind regimes. In this discussion, we present some observation of the temporal and vertical structure of PBL ozone concentrations in a the moderately complex terrain of the Tennessee River Valley. These observations illustrate the relative roles of transport and chemistry in the PBL. To first order, we evaluate the rates of ozone production due to convection and chemistry. Also of interest, are the effects of local sources of ozone-scavenging species which can strongly affect local ozone measurements. We use the presence of an ozone-scavenging power-plant plume to estimate the amount of trace gases required for the observed ozone depletion.

Cassandra Wylie, Tennessee Valley Authority
Wednesday, May 17, 2006, 11:40 am - 12:00 pm

Tennessee Ozone Trends

Data from EPA's AIRS database are used to evaluate seasonal ozone trends from 1979 to 2005 for air quality monitoring stations in Tennessee. Trends are presented for the average of all monitoring stations in Tennessee, as well as for Memphis, Nashville, Knoxville, Chattanooga, Tri-Cities, and the Great Smoky Mountains National Park.

Three different ozone exposure indices are examined: fourth highest eight-hour ozone concentration, second highest one-hour ozone concentration, and number of days with eight-hour ozone concentrations greater than 84 ppb. There is substantial year-to-year variation in these trends with high ozone exposure in 1988, 1998, and 1999 and low exposure in 1989, 1991, 1992, 2003 and 2004. While changes in human-caused VOC and NO_X emissions clearly influence regional ozone levels, weather is also an important source of day-to-day and year-to-year variation in ozone exposure. Days and years with hot, dry, and stagnant weather exhibit elevated ozone exposures, whereas those with cooler, wetter, and windier weather exhibit lower ozone exposures. The spatial distribution of ozone in Tennessee is shown with maps of the number of days with eight-hour ozone concentrations greater than 84 ppb. Just as ozone exposures vary significantly from year-to-year, the spatial distribution of ozone can also vary considerably.

ABSTRACTS

Technical Session II: Modeling & Forecasting Ozone

Moderator: Mike Goldstein, Memphis/Shelby County Health Department

Greg Goodrich, Western Kentucky University
Wednesday, May 17, 2006, 1:00 pm -1:20 pm

A Statistical Model for Ozone Forecasting

Many areas exceed the level of safe ground ozone concentration in the United States. Variability in ground ozone concentration is controlled by local emissions, synoptic and mesoscale meteorology, and boundary layer chemistry. Rural locations, such as Mammoth Cave National Park in south-central Kentucky, often have anomalously high levels of ground ozone concentration that are heavily influenced by topography and mesoscale meteorology. This study will provide a preliminary look at the methodology and initial results of a research project that seeks to determine the relationship between a number of meteorological variables in south-central Kentucky and ground ozone concentration at Mammoth Cave National Park. A statistical model based on the relationships will be developed to forecast ground ozone concentration in rural areas of south-central Kentucky that may not have access to ozone detection equipment. Meteorological conditions that coincide with anomalously high and low levels of ground ozone concentration will be analyzed to determine if specific atmospheric patterns exist that can be used as signals for air quality forecasters.

Jerold Herwehe, NOAA/ARL/Atmospheric Sciences Modeling Division
Wednesday, May 17, 2006, 1:20 pm - 1:40 pm

The NOAA-EPA National Air Quality Forecasting System

Building upon decades of collaboration in air pollution meteorology research, in 2003 the National Oceanic and Atmospheric Administration (NOAA) and the United States Environmental Protection Agency (EPA) signed formal partnership agreements to develop and implement an operational national air quality forecasting (AQF) system. Utilizing comprehensive state-of-the-science numerical models, the AQF system provides air quality guidance for state and local agencies to determine a local air quality index (AQI). The AQF system consists of linking the NOAA National Weather Service (NWS) operational North American Mesoscale (NAM) weather prediction model with the EPA's Community Multiscale Air Quality (CMAQ) modeling system to produce next-day hourly surface ozone (O3) forecasts on a horizontal grid spacing of 12 km. This linked AQF system was tested during the 2003 and 2004 summer ozone seasons for the northeastern U.S., and then became operational in September 2004. In August 2005, the operational AQF domain was expanded over the eastern half of the U.S. The current NAM model is Eta, but the NWS will switch to the WRF-NMM model during the summer of 2006; CMAQ linkage to WRF-NMM is already well under way. Example AQF predictions and analyses from the summer of 2005 will be shown, including comparison with ETOS O_3 observations.

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ABSTRACTS

Les Hook, ORNL - Environmental Sciences Division
Wednesday, May 17, 2006, 1:40 pm - 2:00 pm

NARSTO Support for Atmospheric Science Research and Data Collection Endeavors

NARSTO is a public/private alliance with members from Canada, Mexico, and the United States that is open to science and regulatory agencies, industries, academic institutions, environmental and public interest groups. NARSTO's primary mission is to coordinate and enhance policy-relevant scientific research and assessment of tropospheric pollution. Members have carried out this mission through the successful production of state of the science assessments for ozone, particulate matter, and emission inventory improvement. Additional assessments are being planned.

Direct support of programs undertaking data collection is provided by the Quality Systems Science Center (QSSC). Resources available on the QSSC Web Site [http://cdiac.ornl.gov/programs/NARSTO] include: quality assurance planning guidance and document templates; and data management planning guidance for 1) developing a project data management policy and plan, 2) consistent data and metadata reporting, 3) using a consistent data file format -- Data Exchange Standard (DES), and 4) using consistent names and units in ICARTT format data files.

Data users are encouraged to browse the data collected by NARSTO member projects that are being archived and are publicly accessible at the NARSTO Permanent Data Archive located at the NASA Langley Research Center Atmospheric Sciences Data Center [http://eosweb.larc.nasa.gov/PRODOCS/narsto/table_narsto.html]. The QSSC also maintains a public access FTP site. A new Google Earth posting of archived NARSTO data sites, other related data sites (e.g., IMPROVE), and links to obtain the respective data is now available.

Mike Goldstein, Memphis and Shelby County Health Department
Wednesday, May 17, 2006, 2:00 pm - 2:20 pm

Cooperative Forecasting - TVA and MSCHD

The Tennessee Valley Authority has been producing regression analysis forecast tolls for use in guidance for several years Two of the recipients of these tools include the Tennessee Department of Environment and Conservation (TDEC) and the Memphis and Shelby County Health Department (MSCHD) to help forecast the maximum 8-hour ozone values. Every year, TVA adds the data from the precious year, analyzes the performance of the forecast model from the previous year, and make adjustments to the upcoming year forecast model in order to increase accuracy.

The TVA forecast model is a critical tool for the MSSHD in the use of determining next-day and second-day maximum 8-hour ozone values. The tool uses a Microsoft Excel spreadsheet where values from both ozone monitors and weather forecasts are entered into the equation. The forecasted weather values are from both the surface as well as lower-level areas of the atmosphere. TVA uses the MM5 run from the previous day (0000 UTC) to determine the values that will be inserted into the Day 1 and Day 2 forecasts.

MSCHD uses this data for one of the three model runs when forecasting for ground-level ozone. The second and third model runs use a variety of inputs from three different statistical weather models for surface data and BUFKIT for upper-air data. The MSCHD meteorologist compiled the results from each model and adjusted the numbers to a slightly higher and lower value based on the strength of the weather parameters as well as any other factors that were thought to affect the forecast.

This presentation will show how each model performed during the 2005 ozone season as well as their performance during the current year.

Air Quality Poster Session

Wednesday, May 17, 2006, 5:30 pm - 7:30 pm

Sigurd W. Christensen
NARSTO Quality Systems Science Center, Oak Ridge National Laboratory

Accessing Atmospheric Chemistry, Particulate Matter, and Meteorological Data in the NARSO Data Archive

Invaluable atmospheric measurement data collected by NARSTO-affiliated projects are being archived and are publicly accessible at the NARSTO Permanent Data Archive (PDA) located at the NASA Langley Research Center Atmospheric Sciences Data Center (ASDC).

Data from major collection efforts, including the U.S. EPA Particulate Matter (PM) Supersites Program, Environment Canada Pacific 2001 Air Quality Study, and Southern Oxidants Study – Nashville 1999, are available. General data types, from both ground sites and airborne platforms, include: filter and continuous PM mass and chemistry; particle number, size, and optical properties; meteorological measurements; canister VOC analyses; single particle size and chemical composition; continuous gaseous measurements; and LIDAR data.

Documentation accompanies each data set, including: overview summary documents with points of contact, readme files, and sample plots and images. More detailed information may include Project sampling plans, QA plans, final QA reports, and research procedures as provided by the project.

The data files are in the NARSTO Data Exchange Standard (DES) format. The DES files are self-documenting, have a tabular layout, and are stored as spreadsheet-friendly ASCII comma-separated values files (.csv). The DES has a standardized set of metadata fields with defined consistent values that are applied across all projects and data types and are described in detail on the QSSC web site [http://cdiac.esd.ornl.gov/programs/NARSTO/].

To access the data at the ASDC, link to NARSTO Data Sets page on their web site [http://eosweb.larc.nasa.gov/PRODOCS/narsto/table_narsto.html]. Assistance with obtaining and using archived data may be requested from the ASDC or the NARSTO QSSC.

ABSTRACTS

M. Justin Davis
University of Tennessee, School of Communication Studies

Communicating Realities: Raising Citizens' Environmental Awareness

The ongoing debate about environmental issues in the mass media sensationalize conflicting perspectives regarding the state of the environment. Such rhetorical bantering generally discusses the significance, harms, inherency, and solutions offered by the opposing perspectives, consequently leaving an interested U. S. public to decipher the "truth" regarding these conflicting messages about the environment. Discourse discounting contemporary environmental ills tends to employ arguments of significance to suggest that "X environmental issue" is not an immediate threat to us. Rhetorically, however, such a perspective concedes that "X environmental issue" is happening. This work suggests that when communicating environmental issues to the U. S. public, academics, researchers, and policy makers should strategically focus on linking the significance of "X environmental issue" to both the public and the individual.

Natasha Guenova
University of Tennessee

Political Sciences

As part of a class project in Dr. B. Tonn's class in Environmental Planning, the potential impacts of global warming on air quality in the Knox County region were studied. Review of previous research suggests that global warming could significantly worsen air quality in Knox County. First, increases in air temperature could result in increasing levels of tropospheric ozone pollution. Second, increasing temperatures and more frequent and prolonged periods of drought could result in the creation of more dust and in more frequent forest fires, both of which could result in increased levels of particulate matter. Third, higher temperatures could result in increasing demands for electricity for summer-time air conditioning. To the degree that increasing demands for electricity are met by fossil fuels, and especially coal, then additional increases in ozone and particulate matter could be anticipated. This would be a major problem for Knox County because it already is in non-attainment for both ozone and particulate matter. Worsening air quality could have major impacts on economic growth, human health and ecological health. Conversely, restrictions on going outdoors and recreating may increase risks people face from indoor pollution in their homes and 'sick' buildings in which they work. The preferable solution is to mitigate the emissions of greenhouse gases. Unfortunately, Knox County has virtually no influence in this area. Its only rational course of action is to prepare to adapt to the potential impacts of climate change.

Todd Kuiken
Tennessee Technology University, Chemistry and Environmental Science Department

Mercury Air/Surface Exchange within Deciduous Forests: Implications for Scaling and Modeling

Although there has been significant progress in our understanding of Hg emissions from natural enriched sites, especially in the western U.S., the data on Hg air/surface exchange fluxes from litter covered forest floors is still limited. Considering that forests cover approximately 33.1% of the terrestrial surface in the U.S., this data is highly important in understanding the transport of Hg in the environment. Two coupled

field campaigns were recently completed from January 2004 to January 2005 within Standing Stone State Forest (SSSF) in Overton County on the Cumberland Plateau of Tennessee and during May and June of 2005 at six separate forested sites in the eastern U.S. across a transect covering South Carolina, North Carolina, New Jersey, Pennsylvania, New York, and Maine. The study at the Tennessee site was focused on obtaining a yearlong data set of Hg air/surface exchange fluxes in a southern deciduous forested system. The daytime fluxes were measured over the forest floor on a monthly time step. The field campaign across the eastern U.S. was targeted at probing spatial variations of the Hg air/surface exchange in forest systems and verifying the findings obtained at the Tennessee site. Our research showed that the Hg air/surface exchange fluxes for daytime were below 0.5 ng m-2 h-1 both for the TN site and for the six sites across the eastern U.S. The results obtained from both field campaigns agreed well with each other. These daytime Hg fluxes were very low with variations and thus should be interpreted cautiously. More research into air/forest floor mercury exchange and the related mechanisms should be conducted in order to develop more comprehensive and accurate Hg cycle models.

Hong Zhang
Tennessee Technology University, Chemistry and Environmental Science Department

Air/surface exchange of gaseous mercury in Cane Creek Lake of Putnam County (TN)

The knowledge and understanding of the air/surface exchange of aqueous gaseous mercury in aquatic systems are important for fully revealing the biogeochemical cycle of Hg and tracing its fate in the environment. A model simulation study was conducted to test the sensitivity of the Two-Thin-Film Model (TTFM) to wind speed, dissolved gaseous mercury (DGM) concentration, air Hg concentration, and water temperature. The TTFM has been widely adopted to estimate Hg emission fluxes from natural waters. Our simulation results suggest that this model is most sensitive to wind speed and temperature, which affect the water-side gas transfer coefficient. We also compared the Hg emission fluxes obtained using the dynamic flux chamber (DFC) method and those estimated using the TTFM. The comparison shows that depending on the particular form of the model used, the model could either underestimate or overestimate the emission fluxes compared to the fluxes obtained with the DFC method.

Plenary Session II: Particulate Matter (PM) in East Tennessee

Moderator: Tilden P. Meyers, Deputy Director, NOAA/ARL/Atmospheric Turbulence & Diffusion Division

Quincy Styke, III, Deputy Director, Division of Air Pollution Control, TDEC
Thursday, May 18, 2006, 8:30 am - 9:00 am

Policy/Regulatory Issues Regarding PM 2.5

A federal designation of nonattainment for an area that exceeds a National Ambient Air Quality Standard or for an area that is significantly contributing to another area's air quality in excess of the standards necessitates a revision to the State Implementation Plan. The presentation will focus on the counties in Tennessee that have been federally designated as nonattainment for fine particles (PM 2.5) and the tasks Tennessee must complete to bring these areas into attainment as quickly as possible, but no later than federal statutes and regulations allow.

ABSTRACTS

Pat Brewer, VISTAS Technical Coordinator
Thursday, May 18, 2006, 9:00 am - 9:30 am

Particulate Matter Monitoring and Modeling in the Southeastern US

The ten southeastern states are cooperating to provide technical analyses to support State Implementation Plans to demonstrate attainment of National Ambient Air Quality Standards for ozone and for fine particulate matter (PM2.5) and to demonstrate reasonable progress to improve visibility in Class I national parks and wilderness areas.

This paper describes air quality trends and source contributions to PM2.5 mass and pollutant composition in urban and Class I areas in the southeastern U. S. Ammonium sulfate is the largest contributor to PM2.5 mass in Class I areas, while in urban areas ammonium sulfate and organic carbon are the major contributors. Ammonium nitrate, soil, and elemental carbon have smaller contributions. Electric generating utilities (EGU) and industrial sources are the largest sources of sulfur dioxide, while several source types including fossil fuel combustion, forest fire, and vegetative emissions contribute to organic carbon.

To evaluate the air quality benefits of existing federal and state regulations (including the Clean Air Interstate Rule, industrial and motor vehicle controls, and clean fuels) emissions in 2002 are projected to 2009 and 2018. The Community Multiscale Air Quality model (CMAQ) is being applied for a 12-km grid over the eastern US using 2002 meteorology and emissions inventories for 2002, 2009, and 2018. Results to date indicate that most states will attain the ozone and PM2.5 standards by 2009 and demonstrate reasonable progress to improve visibility by 2018. Additional emissions control strategies are being considered as necessary to comply with the regional haze, PM2.5, and ozone requirements.

Technical Session III: Measurement and Monitoring of Particulate Matter, Haze, and Deposition

Moderator: Roger Tanner, Tennessee Valley Authority

Bruce Hicks, METCORPS
Thursday, May 18, 2006, 9:50 am - 10:10 am

Dry Deposition -- Some Recent Developments

There have been many assessments of atmospheric deposition in the area of the Great Smoky Mountains National Park. These have resulted in a general recognition that atmospheric deposition is an important phenomenon, affecting many of the ecosystems within the Park and along the Appalachian chain. Without exception, these assessments have made use of models to describe the rates of exchange of air pollutants with the surface and its vegetation. These models share the same basic understanding of the air-surface exchange process. In the 1990s, suspicions arose that this understanding was quite deficient, and a series of studies was started to explore the matter. These studies continued through the 1990s. They have shown that indeed

there are grave errors arising if the results of classical micrometeorological studies are applied in mountainous areas, among which the Great Smoky Mountains are good examples. Recently, independent studies of canopy throughfall have reached the same conclusion. The status of these two lines of research will be discussed, and their convergence on a new understanding of the air-surface exchange process will be summarized. The conclusion is clear. Dry deposition rates of air pollutants like ozone and nitric acid vapor have been substantially underestimated in all of the assessments conducted so far, by amounts that will vary according to the local topography and canopy characteristics but by as much as an order of magnitude in some circumstances.

Roger Tanner, Tennessee Valley Authority
Thursday, May 18, 2006, 10:10 am - 10:30 am

Diurnal Variation in Aerosol Chemical Composition from Reconstructed Fine Mass

Simultaneous measurements of the major constituents of PM2.5 atmospheric aerosols (sulfate, organic and elemental carbon, nitrate, ammonium) can now be made with a time resolution of 1 hour or less. The composition of PM2.5 mass at two urban Tennessee Valley locations (Muscle Shoals, AL, and Chattanooga, TN) was reconstructed from these measurements and compared with hourly measured total PM2.5 mass (by TEOM with FDMS) and with speciated 24 hr filter samples collected with FRM monitor. The data sets were also compared with data previously collected from a background site and differences in the diurnal patterns between rural and urban sites are observed. Diurnal patterns for primary aerosol species (e.g. black carbon) are generally stronger than for stable secondary species, especially regionally distributed species such as sulfate. Semi-volatile species such as nitrate may exhibit more complex patterns. The feasibility of using hourly constructed mass to directly relate human exposure to PM with activity patterns, and seasonal variations in aerosol composition are examined.

Carmen DeLong
Thursday, May 18, 2006, 10:30 am - 10:50 am

Adopting CARB

California Air Resources Board has made significant progress toward the remediation of severe air pollution problems in the State of California as well as implementing policies to minimize air pollution now and in the future. Their methodologies were effective and should be observed and applied here in Tennessee.

ABSTRACTS

Jim Renfro, National Park Service, Great Smoky Mountains National Park
Thursday, May 18, 2006, 10:50 am - 11:10 am

Overview of the Air Quality Monitoring and Research Program at Great Smoky Mountains National Park

Monitoring and research conducted over the past 26 years in Great Smoky Mountains National Park has shown that air emissions (and resulting pollutants) generated outside the park and transported into the park, are significantly impacting park resources (streams, soils, aquatic life, vegetation and visibility), visitor enjoyment and potentially public health. The burning of fossil fuels (e.g. coal, oil, and gasoline) produces air emissions that convert into harmful secondary pollutants (e.g. fine particles, sulfates, nitrates, and ozone). Winds blowing toward the southern Appalachian Mountains carry these pollutants from nearby sources and from sources as far away as the Midwest, and cities of the Southeast. The height and physical structure of the mountains and nearby valleys, combined with predominant weather patterns, tend to trap and concentrate air pollution entering the mountains and predispose the park's air quality.

This presentation will provide an overview of the air monitoring and research program at the park, the status and trends of air quality in and around the park and on-going efforts addressing these issues. Discussion will focus on the air pollution problems that degrade scenic views from fine particle pollution and regional haze, acid deposition impacts from excessive nitrogen and sulfur to aquatic and terrestrial systems, ozone pollution impacts to park vegetation, and non-attainment of the 8-hour ozone health standard. Results will show that over the past five years, park air quality has improved significantly. However, there are still considerable challenges that lie ahead as we work toward attainment and restoration of park resources.

Joshua Fu, University of Tennessee
Thursday, May 18, 2006, 11:10 am - 11:30 am

Seasonal Distribution and Modeling of Diesel Particulate Matter in the Southeast US

The fine, ultra fine, and nano sizes of diesel particulate mater (DPM) are of great health concern and significantly contribute to the overall cancer risk from air toxics. The composition of these particles is composed principally of elemental carbon (EC) with adsorbed organic compounds, sulfate, nitrate, ammonia, metals, and other trace elements. The purpose of this study was to depict the seasonality and modeling of particulate matter in Southeastern US produced by the diesel fueled sources (DFS). The modeling works came from four month cases including March, June, September, and December to represent different seasons in 2003 by linking Models-3/CMAQ and SMOKE. The 1999 National Emissions Inventory Version 3 (NEI99) was used in this analysis for point, area, and non-road sources, whereas National Mobile Inventory Model (NMIM) was used to create the on-road emissions. The year 2003 was used for meteorological data and modeling performance. Three urban areas were selected to compare the main results. The model over-predicted the PM2.5 concentration for each site of each city, mainly during cold months. CMAQ does not perform well for PM2.5 for cold seasons. Important hourly DPM seasonality was observed for each city, whose highest concentration occurred at the morning traffic rush hours. The highest DPM concentrations were produced in Atlanta. The annual DPM concentrations for Atlanta, Nashville, and Birmingham were 1.09, 0.55, and 0.47 ug/m3, respectively. The EC contributions of primary DPM were similar for all three sites (~74%). The results showed that there is no significant daily seasonality of DPM contribution to PM2.5 for any of these three cities 2003. The annual DPM contribution to total PM2.5 for Atlanta, Nashville, and Birmingham were 3.7%, 2.5%, and 2.2%, respectively.

ABSTRACTS

Tilden Meyers, NOAA/ARL/ Atmospheric Turbulence & Diffusion Division
Thursday, May 18, 2006, 11:30 am - 11:50 am

A Re-Examination of Models for Computing the Deposition of PM 2.5 Sulfate and Nitrate

The impact of dry deposition of sulfur and nitrogen compounds continues to be an important issue with regard to nutrient cycling and acid deposition. Improvements in the parameterizations for aerosol deposition have proceeded at a slower pace than for gas phase compounds. Although there have been some breakthroughs in the measurement of speciated aerosols more uncertainties exist for aerosol since many of the measurement methods are only recently be evaluated for direct measurements of dry deposition using micrometeorological methods. Experiments conducted in the early 1980s still form the basis for parameterizations that are used to compute the annual loadings of sulfur and nitrogen in dry deposition monitoring networks in the North America. Measurements have indicated that deposition velocities for aerosols are a function of the friction velocity, implying some dependency on the leaf area index which controls, in part, the aerodynamic roughness of the surface. Although gas phase components of sulfur and nitrogen, in most circumstances, dominate the dry deposition relative to their aerosol counterpart, there are some circumstances in which the aerosol components are thought to play a significant role, such as in coastal ecosystems and high elevation sites. Improvements in aerosol measurement technology has been applied recently in experiments to evaluate aerosol deposition processes in Europe and the U.S where atmospheric concentrations of gas- and aerosol-phase nitrogen can be large and loadings have been determined to be a significant contribution of the total annual nitrogen input. Some of these experiments have also suggested that fine aerosol deposition velocities (aerosols with diameters < 2.5 mm) are greater than those currently used in many dry deposition models. Historical and more recent parameterizations of aerosol deposition velocities and the implications for annual particle loadings of nitrate and sulfate and presented and discussed.

Technical Session IV: Measurement and Modeling Particulate Matter

Moderator: Kathy Jones, Chattanooga-Hamilton County Air Pollution Control

Stephen Nichols, UT SimCenter at Chattanooga
Thursday, May 18, 2006, 1:00 pm - 1:20 pm

Contaminant Transport in an Urban Environment

The release of a neutrally buoyant contaminant in an urban environment is simulated for multiple scenarios on an unstructured mesh. General atmospheric boundary layer modeling is included in the simulation. Of particular interest is the low level turbulent mixing in the street canyons. When compared with standard turbulence modeling, Detached Eddy Simulation is shown to be vital for accurate representation of low level air flow and contaminant transport.

The presentation will include a brief description of the computational approach, grid generation, and the turbulence modeling issues of this simulation. An animation of a time-accurate release scenario will conclude the presentation.

ABSTRACTS

William J. Parkhurst, Tennessee Valley Authority
Thursday, May 18, 2006, 1:20 pm - 1:40 pm

Montgomery County PM 2.5 Episodes

The Tennessee Valley Authority (TVA) in cooperation with the state of Tennessee operated a continuous TEOM fine particle (PM2.5) monitor in Montgomery County, TN, which is approximately fifty miles north-northwest of Nashville, TN. This monitor recorded unusually elevated PM2.5 levels from September 5 – 15, 2005 compared to other monitors in and around the Tennessee Valley region. TVA and Tennessee Department of Environment & Conservation conducted a case study analysis of this episode considering the relationship between PM2.5 levels and various meteorological variables and potential local, regional and long-range sources. Surface winds throughout the period were light and had a northerly component September 5 – 10, were variable September 11 – 12, and had a southerly component September 13 – 15, corresponding to a high pressure system slowly progressing from west to east throughout the period. Hourly dew point and relative humidity observations were relatively high (relative humidity generally above 90%) from 10pm – 8am for each day, which corresponded well with several of the higher PM2.5 observations recorded in the pre-dawn hours. It is suspected that early morning inversions and stagnant conditions throughout the day associated with the high pressure system hindered the transport and dilution of PM2.5 levels caused by emissions from local sources such as agricultural burning, as well as long range transport of smoke from fires occurring in Idaho during the first half of the period. One concern of this episode is how unusually elevated PM2.5 levl3es occurring in a relatively short time period can influence the annual average for this site.

Kathy Jones, Chattanooga-Hamilton County Air Pollution Control
Thursday, May 18, 2006, 1:40 pm - 2:00 pm

Comments About EPA's new Exceptional Event Proposed Rule

On March 10, 2006, EPA proposed a new rule to govern the review and handling of air quality monitoring data influenced by exceptional events. This presentation will be a review of the proposals and a review of written comments submitted by Kathy Jones to the docket file. The comments include disagreement with EPA's proposed limitation of exceptional event requests to exceedances only, disagreement with the proposed 95th percentile and 75th/95th tiered percentile options for proving statistically than an event happened, and disagreement with EPA's case by case evaluations. These comments include discussion about time requirements for submission.

Air Quality Poster Session and Taste of Tennessee Reception

The ETOS 2006 Science Workshop is sponsoring an Air Quality Poster Session and "Taste of Tennessee" Evening Reception on Wednesday, May 17 from 5:30-7:30 pm in the lobby of the Pollard Technology Conference Center. Researchers will display posters detailing air quality studies from across the State of Tennessee. The "Taste of Tennessee" reception will also showcase local talent and highlight goods that are produced in the State of Tennessee.

*Entertainment for the reception will be provided by **Wild Blue Yonder**, a progressive bluegrass band from Knoxville. Wild Blue Yonder's debut CD, "Bolt Out Of The Blue," continues to bring the band regional notoriety with its wickedly clever and now-infamous novelty hit, "The Possum Crawls Tonight." Their second project, "Above & Beyond," was released in May of 2004 and is a heartwarming, soulful, and foot-stomping foray into the outer reaches of bluegrass. With seven original tunes, searing twin fiddles, and the funkiest banjo in town, Wild Blue Yonder stretches the limits of acoustic music on their follow-up disc. (www.WildBlueYonderBand.com)*

*Buddy Smothers came to Knoxville in 1954 to manage a small loan company. He and his wife Lamuriel, both from Alabama, found the city they liked but couldn't find barbecue they liked. Around 1967, Lamuriel purchased the Pixie Drive-In in Seymour, TN. The second year the business increased sales 240%! Buddy quit the loan business and joined Lamuriel thus began their restaurant career. **Buddy's Bar-B-Q** emerged and has been a tremendous success for the entire family. Last year the Company celebrated their 30th year as Buddy's Bar-B-Q. There are currently twelve company owned stores, three franchised stores, a full scale catering department, and the latest addition, The Bearden Banquet Hall. (www.buddysbarbq.com)*

Other Tennessee products will also be served during the workshop breaks.

*The Chattanooga Bakery was founded in the early 1900's as a subsidiary of the Mountain City Flour Mill in Chattanooga. The bakery's original purpose was to use the excess flour produced by the mill. In 1917, the bakery developed a product which is still known as the **MoonPie**. Early in the 1900s, while servicing his territory of Kentucky, Tennessee and West Virginia, Earl Mitchell, Sr. was visiting a company store that catered to the coal miners. He asked them what they might enjoy as a snack. The miners said they wanted something for their lunch pails. It had to be solid and filling. "About how big?," Mr. Mitchell asked. Well about that time the moon was rising, so a miner held out his big hands, framing the moon and said, "About that big!" So, with that in mind, Mr. Mitchell headed back to the bakery with an idea. Upon his return he noticed some of the workers dipping graham cookies into marshmallow and laying them on the window sill to harden. So they added another cookie and a generous coating of chocolate and sent them back for the workers to try. In fact, they sent MoonPie samples around with their other salespeople, too. The response they got back was so enormous that the MoonPies became a regular item for the bakery. (www.moonpie.com)*

*In 1912, in a copper kettle at the Standard Candy Company at Clark & First Avenue in Nashville, the world's first ever combination candy bar was invented. The **GooGoo Cluster** is a round mound of caramel, marshmallow, fresh roasted peanuts, and pure milk chocolate. Some people say that the candy was named GooGoo because it's the first thing a baby says. Howell Campbell, Jr., the man whose father invented the GooGoo Cluster, says that his father used to ride the streetcar to work everyday and he would talk the matter over with fellow passengers. He maintains that a lady schoolteacher suggested the name GooGoo to Mr. Campbell one morning. One of the most interesting facts about the GooGoo Cluster is its association with one its longest running sponsors, the Grand Ole Opry. As they say there, "Generations of Southerners have grown up on them." (www.googoo.com)*

Acknowledgments

East Tennessee Ozone Study (ETOS) 2006 Science Workshop Steering Committee

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