17th International Emission Inventory Conference

"Inventory Evolution – Portal to Improved Air Quality"

Courses June 2, 2008
Conference June 3-5, 2008
Portland, Oregon – Doubletree Hotel

Sponsored by:
Emission Inventory and Analysis Group
Air Quality Assessment Division
Office of Air Quality Planning and Standards

Welcome to the 17th Annual Emissions Inventory Conference

The US Environmental Protection Agency (EPA) looks forward to your participation in the 17th Annual Emissions Inventory Conference in Portland Oregon June 2-5, 2008. This year's Conference theme emphasizes the evolving uses of the emissions inventory, the motivation of those uses, and the impact those uses have on emissions data development.

Training courses on different aspects of inventory preparation and use will be held on Monday, June 2. After the training day on Monday, the general Conference will open with a Plenary Session for all Conference attendees on the morning of Tuesday, June 3. The plenary will include a welcome by the US EPA and local hosts, and a report from the US EPA Emissions Inventory and Analysis Group, followed by a panel of speakers. Doug Solomon, Group Leader of the Emissions Inventory and Analysis Group, of the EPA's Office of Air Quality Planning and Standards (OAQPS) will serve as moderator for the panel. The speakers assembled for the panel represent the perspective of the regulated community regarding the role of proper emissions characterization in implementing air quality programs. We have highlighted some evolving air quality program areas that rely on good emissions inventory data, and which focus on health and air quality improvements on a local, regional, and global scale:

- Local attainment of the PM NAAQS (National Ambient Air Quality Standard for Particulate Matter);
- National mitigation / reduction of residual risks from air toxics; and
- Global adaptation to climate change and reduction of greenhouse gas emissions.

The following industry representatives will share their perspectives with us:

<u>Local scale - (PM) NAAQS</u>
John Crouch, Director of Public Affairs - Hearth, Patio and Barbecue Association
Focus: Woodstove change-out program in the mid and northwest United States and the influence of proper emissions characterization in developing sector strategies for emission reduction.

<u>Regional / national scale - residual risk reduction for toxic air emissions</u>
Jan L. Laughlin, Regulatory Issues Coordinator - Air, Health, Safety & Environment - Conoco Phillips
Focus: US EPA's Residual Risk and Technology Rule (RTR) and the importance of proper emission characterization in targeting emission reduction programs.

<u>Global scale - GHG emissions</u>
Jeff C. Muffat, Manager Environmental Regulatory Affairs - 3M
Focus: The importance of proper GHG emissions characterization and the role of corporate operations – domestic and global, in understanding carbon footprint.

Following the Plenary, the technical sessions will commence on Tuesday afternoon. Many of the technical sessions are similar to those from earlier years and others continue to evolve in response to changing program needs. A few of the sessions will include some focused panel discussions and should provide a nice integration of practical field experiences.

On Tuesday evening, we will have a Poster Session and Exhibitor Reception from 6:00 – 8:00 pm. Attending the reception is a great way to connect with other conference attendees and to discuss your air quality program needs with several exhibitors. We have a very interesting lineup of poster presentations and the authors will be available to explain their work and answer your questions. As we did last year, we intend to mix fun with work by offering attendees the opportunity to vote for the posters of their choice and award prizes to the winners so please stop by and participate.

We are also trying something new this year by hosting an emissions inventory ‘Software Showcase’. The showcase is for both private sector software developers and public entities to demonstrate their wares to Conference attendees. Federal, state, local, and tribal agency staff as well as consultants will showcase their efforts with you regarding development and application of emissions inventory related software. We hope the showcase will lead to a sharing of ideas and solutions among those involved in developing and using software for emissions inventory applications. Demonstrations will be available throughout the day Tuesday and Wednesday. The showcase will be held on the second floor in the Portland Room with each demonstration lasting 30 minutes. The showcase schedule is included in the following pages of this program.

This is a great opportunity to keep abreast of developments in the world of emissions data and to share your experiences with other emission inventory professionals from federal/state/local and international regulatory agencies, tribal governments, industry and academia. We think you will also enjoy being in Portland and hope you are able to visit some of its green spaces and natural wonders. We appreciate the support we have received from our colleagues at the Oregon Department of Environmental Quality (OR DEQ) in planning this Conference and look forward to seeing you at the Conference.

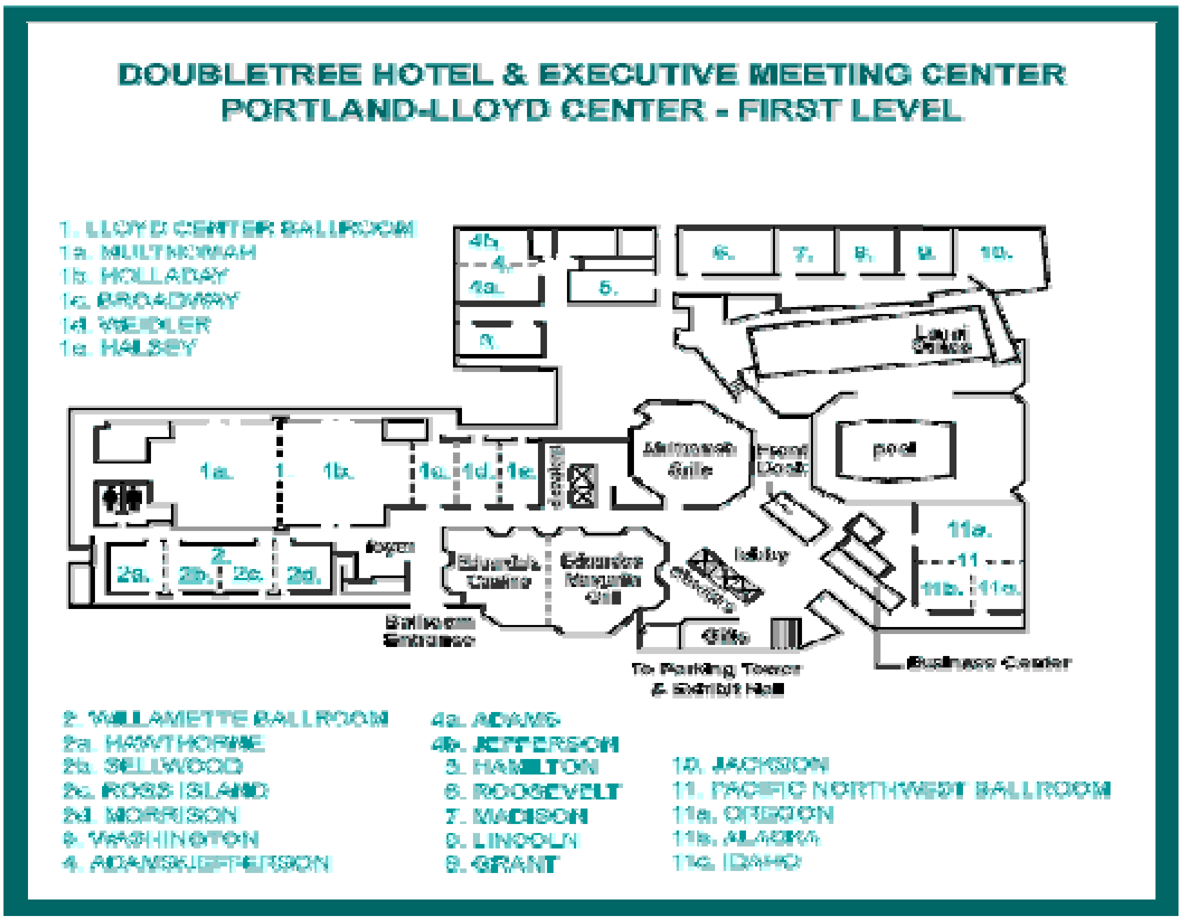
US EPA Conference Organizers
Emission Inventory and Analysis Group
Office of Air Quality Planning & Standards

Schedule at a Glance

Date/Time	Session	Room
Mon. June 2		
8:30 - 5:00	EIS Gateway/EIS Reporting Format	Multnomah
8:30 - 5:00	NMIM/MOVES	Holladay
8:30 - 500	GHG Inventory 101/GHG Inventory Tool	Broad/Weid/Hals
8:30 - 5:00	Intro to Emissions Inventory Part 1/2	Oregon
Tue. June 3		
8:00 – 8:30	Software Showcase	Portland
9:00 - 12:00 10:00 – 10:30	Welcome US EPA NEI Status Report ***Break – Software Showcase*** Panel: Evolving Regulatory Uses of the Inventory Industrial Perspectives - • Local-scale (PM NAAQS) • National-scale (residual risk air toxics) • Global-scale (greenhouse gases)	Multnomah/Holladay Portland
12:00 – 12:30	**Lunch (On Your Own)** Software Showcase	Portland
1:30 - 2:45	- Session 1 – Innovative EI Development Methods	Multnomah
	- Session 2 – Stationary Source	Holladay
	- Session 3 – Global/International Issues	Broad/Weid/Hals
2:45 - 3:15	**Break –** Software Showcase	Portland
3:15 – 4:55	- Session 1 – Continues	Multnomah
	- Session 2 – Continues	Holladay
	- Session 3 – Continues	Broad/Weid/Hals
5:00 – 5:30	Software Showcase	Portland
6:00 – 8:00	- Poster Session and Exhibitors' Reception	Willamette Ballroom
Wed. June 4		
8:00 – 8:30	Software Showcase	Portland
8:30 – 9:45	- Session 4 – Emission Factors	Multnomah
	- Session 5 – Greenhouse Gases	Holladay
	- Session 6 – EI Preparation for Modeling	Broad/Weid/Hals
9:45 – 10:15	**Break –** Software Showcase	Portland
10:15 - 11:55	- Session 4 - Continues	Multnomah
	- Session 5 - Continues	Holladay
	- Session 6 - Continues	Broad/Weid/Hals
12:00 – 12:30	**Lunch (On Your Own)** Software Showcase	Portland
1:30 - 2:45	- Session 6 – EI Preparation for Modeling	Broad/Weid/Hals
	- Session 7 – Air Toxics	Multnomah
	- Session 8 – Tools – Emissions Data Sharing & Assessment	Holladay
2:45 - 3:15	**Break –** Software Showcase	Portland
3:15 - 4:55	- Session 7 - Continues	Multnomah
	- Session 8 - Continues	Holladay
	- Session 9 – Emission Inventory Data Analysis	Broad/Weid/Hals
5:00 – 5:30	Software Showcase	Portland
6:00 – 8:00	EPA HQ/RO Meeting	Weidler

Schedule at a Glance (continue)

Date/Time	Session	Room
Thurs. June 5		
8:30 - 9:45	- Session 10 - EI Validation and Quality Assurance	Multnomah
	- Session 11 – Mobile Sources	Holladay
	- Session 12 – PM: Agriculture & Ammonia; Managed Burning & Wildfires	Broad/Weid/Hals
9:45 - 10:15	**Break**	
10:15 - 11:55	- Session 10 - Continues	Multnomah
	- Session 11 - Continues	Holladay
	- Session 12 - Continues	Broad/Weid/Hals



Emissions Inventory Software Showcase

We are hosting an emissions inventory 'software showcase' for both private sector software developers and public entities to demonstrate their wares to Conference attendees. The following lists the expected participants and software that will be demonstrated. Demonstrations will be available at the designated times listed on Tuesday and Wednesday. Each demonstration will last approximately 30 minutes in the Portland Room on the second level.

June 3, 2008

8:00 am "SPECIATE Data Browser," E. H. Pechan & Associates

> The first draft of the SPECIATE data browser for the EPA SPECUATE Work Group. This is a ColdFusion web application that provides SPECIATE 4.0 source profiles for viewing and downloading (in Excel) via the web.

10:00 am "ArcGIS Gridded Surrogate Tool," Sonoma Technology, Inc

> The ArcGIS Gridded Surrogate Tool is a VBA module built in the ESRI desktop (ArcMap) environment. The tool converts shapefiles of land use and other data into gridded spatial allocation factors for a given modeling grid definition. Gridded surrogates may be generated from polygon, spatial data

12:00 pm "Google Earth Display for the National Emission Inventory, US EPA

> The software provides a method of visualizing the National Emissions Inventory (NEI) on a spatial and temporal level. This interactive tool enables a user to gather more information about a selected facility without having any type of background in data analysis. The visualization software is also available free of charge and the data files are easily accessible through the Air Emissions Sources page through the Office of Air & Radiation.

2:45 pm "Emissions Modeling Framework," US EPA

> The EMF stores, organizes, and helps QA emission inventories and other data needed for emissions modeling. It allows users to organize these inputs into cases for running SMOKE. It allows users to run SMOKE and register the SMOKE outputs with the EMF for further QA and/or post-processing

5:00 pm "Environmental Knowledge and Assessment Tool (EKAT)," Kansas State University

> EKAT contains a tool called EmisCalc, which may be used to estimate actual emissions or calculate potential to emit for processes included in the EPA Factor Information Retrieval (FIRE) database. Supports air permitting requirements. The results of using EmisCalc are a report of calculated emissions for user specified level of activity or fuel combustion.

Emissions Inventory Software Showcase (continue)

June 4, 2008

8:00 am “Control Strategy Tool and the Emissions Modeling Framework,” University of North Carolina

The Emissions Modeling Framework (EMF) manages emissions inventories and related data files that are used by emissions models that use the inventories to create emissions inputs for air quality models. The Control Strategy Tool works within the EMF to develop controlled inventories based on a database of available control measures and user instructions.

9:45 am “Emissions Accountant,” Mitchell Scientific

Emissions Accountant is a software program that is used by industry to develop and maintain an air emissions inventory. The program contains a database of emission factors for each chemical process that is operated by the company. Emissions Accountant applies the speciated emission factors for each process in conjunction with the production schedule to report the emissions from a facility for a specified period of time.

12:00 pm “EIGIS-Emissions Inventories from the Ground Up,” RWDI

RWDI's GIS-based Emission Inventory system (EIGIS) was originally developed for Environment Canada but has since been used in other geographic regions and for emissions estimates in the US. The EIGIS software solution forms the core to Environment Canada's new approach for computing emission inventories from the bottom-up using state-of-the-art GIS technologies and high resolution datasets. EIGIS has been used for pilot projects in Canada and the U.S. to compute and analyze emissions estimates, generate reports, and prepare SMOKE model input files.

2:45 pm “EIQ Data Entry Program,” St Louis County, MO

For use in managing emissions inventory data and for industry to submit data electronically

5:00 pm “Emissions Master,” Mitchell Scientific

Emission Master is software that contains modeling equations from EIIP Guidance Document “Chapter 16: Methods for Estimating Air Emissions from Chemical Manufacturing Facilities, August 2007” to enable the chemical operator to calculate emissions for batch processing. Emission factors can then be calculated for each process that is operated in the chemical facility.

Exhibitors

University of North Carolina Institute for the Environment - The UNC Institute for the Environment (http://www.ie.unc.edu) and the centers within the Institute, including the Center for Environmental Modeling for Policy Development, Center for Community Design, Center for Energy and Environment. We will also provide demonstrations of tools recently developed at the Institute, include the Emissions Modeling Framework (EMF) and the Control Strategy Tool (CoST). Finally, we will provide information on products distributed by the Community Modeling and Analysis System (CMAS) Center, including the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system, VERDI, and the Spatial Allocator and its related tools.

Eastern Research Group - Eastern Research Group (ERG) offers clients the full spectrum of technical services required to achieve successful air quality management. Our staffs of engineers and atmospheric scientists have over 25 years of experience addressing air quality needs at all project scales for stationary and mobile sources. ERG performs nationally recognized research in areas such as greenhouse gas emissions and controls, air permitting, air toxics emissions assessments, emissions projections, air regulation development, and inventory management. We can assist you with defining and quantifying problems and determining the most technically effective and cost-beneficial solutions for all stakeholders. Our conference exhibit booth will have available materials documenting the breadth of this experience, and key staff from these programs will be on hand to meet you and provide more detailed information and insight on how our capabilities can address your needs.

Ciber, Inc - Founded in 1974, CIBER is a superior consultancy that serves customers around the world from over 60 U.S. offices, 22 European offices and 5 offices in Asia. With offices in 18 countries, annualized revenue run rate of $1 billion and approximately 8,000 employees, CIBER specializes in building, integrating and supporting information technology solutions.

Over the past ten years, CIBER has worked in partnership with Pennsylvania Department of Environmental Protection, Bureau of Air Quality and Connecticut, to develop various web-based solutions. These systems fully support a continuum of interrelated business processes and a variety of stakeholders, including industry facilities, state administrators and policy makers, EPA and other Air Quality policy organizations and networks. Pennsylvania DEP's Bureau of Air Quality relies on these systems to manage: Air Permitting, Emissions Inventory, Emissions Fees, Continuous Emissions Monitoring, Management Reporting and Quality Assurance, Compliance and Enforcement, and Data Exchange and EPA/NEI Reporting

In January of 2008, CIBER was awarded a 6 year contract with the Connecticut Department of Environmental Protection to implement a new web-based Air Emissions Inventory System for the reporting and management of stationary, area and mobile source data. The system also features a greenhouse gas inventory.

CIBER's reputation for designing, developing and implementing software applications of the highest quality and reliability is unparalleled. Beyond system implementations, we also provide application support and maintenance, training and outreach services. Our team members are well respected for their critical subject matter expertise regarding the business of collecting, reporting and managing data for air quality programs.

Please visit us at our booth at the 2008 National Emissions Inventory Conference to learn more about our web-based air quality solutions and to see a system demonstration.

RWDI Air, Inc - Make sure to drop by the RWDI AIR Inc. booth, where representatives Wayne Boulton and Kim O'Neill will be available to answer your questions about the unique services that RWDI has to offer.

RWDI has unique capabilities and expertise in: source testing, environmental software development, airshed modeling - including meteorological modeling and regional photochemistry/dispersion modeling and forecasting, and emissions inventory preparation and processing

RWDI also has advanced computing capabilities for modeling and forecasting applications. At one time, simulations were limited to short smog events or episodes lasting no more than a few days. Using researchgrade computing clusters, RWDI is now capable of simulating smog formation for an entire year, at high resolution, and over large domains.

Wayne Boulton will be hosting a live demo of PlumeRT, a real-time air quality forecasting system on Wed June 4 at 12pm. If you miss the demo session, or would like to learn more about PlumeRT feel free to drop by the RWDI booth for additional demos and a chance to speak with Wayne. Booth Demos of EIGIS, a web-based Emissions Inventory management system will also be available.

US Enivronment Protection Agency, Emission Inventory and Analysis Group - The Emission Inventory and Analysis Group is responsible for developing the National Emissions Inventory (NEI), a national database of air emissions information. NEI is a compilation of data comprising of input from numerous state and local air agencies, tribal nations, industry, and other federal databases. The NEI database contains information on stationary and mobile sources that emit criteria air pollutants and precursors, as well as hazardous air pollutants. NEI data are used for air dispersion modeling; tracking emission trends; and developing risk assessments, regulations, and regional pollution control strategies.

Demonstrations will be given Tuesday, June 3rd on using Google Earth and the Emissions Modeling Framework in the analysis of NEI data. We will also have information on the new Emission Inventory System (EIS) for the NEI, and the Consolidated Emissions Reporting Schema for the reporting of NEI and Climate Registry data.

E. H. Pechan & Associates, Inc. - Since 1981, E.H. Pechan & Associate's core business has been to provide air pollution consulting and information technology services. We have extensive experience in supporting EPA, and many State and regional air authorities in assessing their air pollution programs, developing emission inventories, and providing related database support. We specialize in complex databases and models in air pollution policy analyses. The firm has designed, developed, and applied analysis techniques to provide government and private industry with customized tools to gain valuable insight into a wide range of air quality issues.

MACTEC Federal Programs, Inc. - MACTEC, established in 1946, is a leading consulting firm providing information technology (IT), engineering and environmental services to public and private clients worldwide. MACTEC operates in over 100 U.S. offices comprised of 3,000 employees with specialists in over 50 IT, scientific, and engineering disciplines.

MACTEC offers exceptional services in the areas of data management and information technology. The MACTEC Applied Information Technology (AIT) section provides services through a collaboration of computer technology specialists located throughout our network of offices. Our specialties include database, GIS, GPS, CAD, web programming, 3D visualization, and general application programming in network, web, and desktop environments.

MACTEC has provided emissions inventory support for customers for over 15 years through its i-STEPS environmental management software and has provided emission inventory database, NIF support, and QA software tool development for EPA over the past 8 years. Working with the EPA's Measurement Policy Group (MPG), MACTEC developed the Electronic Reporting Tool (ERT). This application provides a method to electronically create and submit stationary source sampling test results to the regulatory agency. ERT provides an export routine to create a file that can be imported into webFIRE for calculating emission factors. MACTEC will provide information on i-STEPS and ERT as well as other examples of MACTEC's abilities at the booth.

Mitchell Scientific, Inc. - Mitchell Scientific, Inc. is a leading provider of environmental software for the chemical industry. We became incorporated in 1990 with a mission to dedicate our resources, our talents, and our energies to benefit environmental health and safety through comprehensive software products and services.

Over the years, Mitchell Scientific, Inc. has made significant contributions to the science of environmental calculations through the development of many of the equations that are used by governments and industries in estimating vent emissions from basic process operations. Specific equations include the depressurization equation (1998), heating equation (1998), purge equation (2004), subsurface addition equation (2005). Additionally, equations have been developed for calculating emissions from vent devices such as condensers, vacuum pumps, and steam jets (2007).

BASIC INFORMATION ON EMISSION MASTER SOFTWARE (Literature will be available at the display table that further describes this software program)

Emission Master is a software program that is compatible with most all US EPA documented procedures for calculating air emissions for batch processes. The program has been developed based on the models contained EPA Document "40 CFR 63.1257" and EIIP Chapter 16 – *Methods for Estimating Air Emissions from Chemical Manufacturing* , August 2007. Available MACT models include *filling*, purging, *heating*, and vacuum, depressurization, *gas evolution*, *solids drying*, and *fixed roof storage tank.* Interactive chemical databases enable one to model multi-phase liquid mixtures. Emission Master supports several vapor pressure models including Antoine, Clapeyron, and Riedel equations. Equation coefficients may be calculated from experimental or referenced vapor pressure data for many of the models.

Emissions Accountant is a program for tracking air emissions based on the process modeling from Emission Master. Just as Emission Master is a precision tool for modeling recipe based chemical processes, Emissions Accountant provides a balanced solution for managing air emissions inventories for the entire plant site. This second program can handle anything that Emission Master can throw its way including emissions data from chemical processes, combustion, storage tanks, and other types of operations. If tracking air emissions is a concern for monthly rolling or yearly reporting requirements then Emissions Accountant is at your service. If analyzing air emissions to meet MACT, MON, or any other regulatory reporting requirement then Emissions Accountant can easily help. And if analyzing the emissions of a single process is needed for state or federal requirements then Emissions Accountant can handle that task as well.

Monday - June 2, 2008

Training **8:30 – 5:00 pm**

Courses will be offered on a first come, first serve basis. Pre-registration is required. Registered participants will be notified of class locations upon check-in.

The EIS Gateway: Your Entry into the Emissions Inventory System
Instructor: Martin Husk, US EPA
Monday June 2, 2008 - Morning

The EPA has undertaken a project to redefine how the US EPA National Emissions Inventory is developed. Part of this effort involves the development of the Emissions Inventory System (EIS), one component of which will be launched this October. Called the EIS Gateway, this portion of the system will provide users with direct access into the EIS database. The purpose of this course is to provide a general introduction to the Gateway. Attendees will receive an overview of the functionality available to them and learn how to use it as part of the new EIS process. For more information on the project to develop the EIS, visit the project web site at http://www.epa.gov/ttn/chief/net/eis.html. Attendance priority is given to State, Local and Tribal staff.

An Introduction to the EIS Reporting Format
Instructor: Martin Husk, US EPA
Monday June 2, 2008 - Afternoon

To support the Emissions Inventory System (EIS) process, a new reporting format was developed for the submission of emissions inventory data. The new process will no longer rely on the NIF format, but will instead use an Extensible Markup Language (XML) file format. The purpose of this course is to introduce attendees to the new XML reporting format, and provide them with a non-technical understanding of XML and how it will be used in the EIS process. It is geared toward the State, Local and Tribal agency staff that develops emissions inventories. Attendance priority is given to State, Local and Tribal staff.

Prior to attending the course, you are encouraged to learn more about the project to develop the EIS by visiting http://www.epa.gov/ttn/chief/net/eis.html. For specific information on how to submit XML data through the EIS, please visit the website http://www.epa.gov/ttn/chief/net/neip/section_9.pdf. For specific information on the EIS XML schema, please visit http://www.epa.gov/ttn/chief/net/neip/appendix_2.pdf.

National Mobile Inventory Model (NMIM)
Instructor: Harvey Michaels, US EPA
Monday June 2, 2008 - Morning

EPA's NMIM is an emissions modeling system that generates county inventories using MOBILE6, NONROAD, and a database of county-level inputs. Participants will learn how to use NMIM on a Windows PC and how to work with the output. In addition to the basics, we plan to cover NMIM's fleet modeling and diesel retrofit capability. As time allows and participant interest indicates, we will also cover other topics, such as modifying the NMIM County Database using simple MySQL commands. The course will be organized around hands-on exercises, but persons without computers are also welcome. Organizations are asked to limit the number of students sent to allow space for the maximum number of individual organizations to attend. Class size will be limited to 50 students with laptop computers and additional students without laptops.

Computers will not be provided, so **PARTICIPANTS MUST BRING THEIR OWN LAPTOPS** running Windows 2000 or newer operating system, but please note that we have not yet tested NMIM on Windows Vista. Minimum configuration is 256 Mb of RAM and three free gigabytes of hard drive space. Participants must have NMIM and MySQL Query Browser installed and running on their machines prior to the course. Please download the latest installation package which includes all needed software, from http://www.epa.gov/otaq/nmim.htm.

Introduction to EPA's Motor Vehicle Emission Simulator (MOVES)
Instructor: David Brzezinski, US EPA
Monday, June 2, 2008 – Afternoon

EPA's MOVES is an emissions modeling system that will eventually replace MOBILE6 and NONROAD as EPA's tool for estimating air pollution emissions from mobile sources. A demonstration version of the model for criteria pollutants, including draft estimates for greenhouse gases and energy consumption from highway vehicles is now available. Participants will learn how to use the highway vehicle demonstration version of MOVES on a Windows PC, including how to create a Run Specification, how to run the model, and how to work with model output. The course will be organized around hands-on exercises, but persons without computers are also welcome. Organizations are asked to limit the number of students sent to allow space for the maximum number of individual organizations to attend. Class size will be limited to 50 students with laptop computers and additional students without laptops.

Computers will not be provided, so **PARTICIPANTS MUST BRING THEIR OWN LAPTOPS** running Windows 2000 or newer operating systems (we have NOT yet tested MOVES with Windows Vista), with a CD drive, a minimum of 256 Mb of RAM, and a minimum of five free gigabytes of hard drive space. Participants must have the demonstration version of MOVES and the MySQL Browser software pre-installed and running on their machines prior to the course. This version of the model, including the browser, is available now on the EPA web site at http://www.epa.gov/otaq/ngm.htm.

Greenhouse Gases Inventory 101
Instructor: Andrea Denny and Leif Hockstad, US EPA
Monday June 2, 2008 – Morning (8:30am-12pm)

This lecture-style course will provide an introduction to greenhouse gas inventories. Topics will include:

- overview of GHG emissions sources in the US
- purpose and scope of a GHG inventory,
- differences between traditional criteria pollutant inventories and GHG inventories
- choosing a baseline year
- quantification approaches (top-down vs. bottom up)
- available software and methodologies
- differences between inventories and registries
- certification and reporting protocols
- comparability
- level of effort

Self-paced Alternative:
A Web-based alternative is available and allows participants to preview this course prior to attendance, or provides the option of remote self-paced training, in lieu of on-site training.
A similar 90 minute web-based training was recorded in October 2007. While aimed at state and local governments, much of the information is broadly applicable.
Access the training at: http://securestaging.icfconsulting.com/Inventory101
To access this site, the user name is greenhouse and the password is gases. Please follow the instructions for viewing: Session 1: Creating an Inventory.

Using EPA's State GHG Inventory Tool
Instructor: Andrea Denny, US EPA
Monday, June 2, 2008 – Afternoon

EPA's State Inventory Tool (SIT) is an interactive Excel-based suite of tools that assists with the development of a state-level greenhouse gas emission inventory. This detailed training for the SIT modules includes utilization of state data to assess GHG emissions by source and sector. This is a hands-on training where attendees enter data and complete sample reports along with the instructor on their own laptops. **ATTENDEES MUST BRING LAPTOPS. Laptops must be equipped with Microsoft Office software – Excel**. The course will cover software infrastructure, data sources, data anomalies, and additional tools and protocols that can be used to supplement inventory results (e.g. Portfolio Manager, Clean Air Climate Protection Software, etc).
Class Size is limited to 25. Attendance priority is given to state government staff.

Self-paced Alternative:
A Web-based alternative is available and allows participants to preview this course prior to attendance, or provides the option of remote self-paced training, in lieu of on-site training.
A similar 90 minute web-based training was recorded in December 2007.
Access the training at: http://securestaging.icfconsulting.com/Inventory101 To access this site, the user name is greenhouse and the password is gases. Please follow the instructions for viewing: Session 3: State Inventory Tool (SIT) Training Session.

Introduction to Emission Inventories
Instructor: Anne Pope, US EPA
Monday, June 2, 2008

This course is delivered in two separate modules – an overview in the morning, and more specific emission estimation exercises in the afternoon. Prior to class, students are strongly encouraged to review the following three training courses available on-line:
1) Introduction to Emission Inventories, APTI Course 419A, October 2004, located at http://epa.gov/air/oaqps/eog/course419a/index.html
2) Preparation of Fine Particle Emission Inventories, APTI Course 419B, September 2004, located at http://www.epa.gov/air/oaqps/eog/course419b/index.html and
3) Introduction to Emission Inventories, May 2007, located at http://www.epa.gov/ttn/chief/conference/ei16/index.html#training.

ATTENDEES MUST BRING LAPTOPS. Laptops must be equipped with Microsoft Office software - ACCESS, Excel, Word, and PowerPoint, and a CD reader. Prior to class attendance, to ensure that laptops can be successfully loaded with course materials, students should download the on-site course materials from the 2008 Emissions Inventory Conference site at http://www.epa.gov/ttn/chief/conference/ei17/index.html. These materials will be made available at the website two weeks prior to the Conference.

Introduction to Emission Inventories Part 1: Overview
Monday, June 2, 2008 – Morning

This hands-on Course introduces students to planning and developing air emission inventories. The morning session will include the following topics:

- uses of emissions inventories
- pollutants
- source categories
- modeling parameters in emission inventories
- emission inventory compilation

Self-paced Alternative
As an alternative to attending the morning overview session, participants should at a minimum view on their own, the training course reference –
Introduction to Emission Inventories, May 2007, located at
http://www.epa.gov/ttn/chief/conference/ei16/index.html#training.
A fuller self-paced study will include also viewing the training course references –
Introduction to Emission Inventories, APTI Course 419A, October 2004, located at
http://epa.gov/air/oaqps/eog/course419a/index.html and
Preparation of Fine Particle Emission Inventories, APTI Course 419B, September 2004, located at http://www.epa.gov/air/oaqps/eog/course419b/index.html .

Introduction to Emission Inventories Part 2: Emission estimation and team exercises
Monday, June 2, 2008 – Afternoon

The afternoon session continues this hands-on course and case studies will be offered to provide more specific discussion and exercises for calculating emissions from point and non-point sources. The procedures for calculating emissions from mobile sources are covered in other training courses.

In addition to this basic instruction module, we have many documents that discuss in detail the development and maintenance of an emission inventory, and the details of estimating emissions from many specific stationary and nonroad mobile source categories. These materials are available at the following web link and are recommended as more specific references for emissions data developers - http://www.epa.gov/ttn/chief/eiip/techreport/ .

Tuesday - June 3, 2008

Session 1. Innovative Emission Inventory Development Methods

Chairs: Madonna Narvaez, US EPA
Wayne Boulton, RWDI

1:30 "High Resolution on the High Seas: The Unprecedented Detail of the 2005-2006 British Columbia Ocean-Going Vessel Emissions," R. Bryant, B. McEwen, E. Hou, S. Sidi, R. Quan, A. Green

The Chamber of Shipping of British Columbia (B.C.), along with SENES Consultants, Environment Canada and Metro Vancouver (formerly the Greater Vancouver Regional District), compiled an emissions inventory for ocean-going vessels calling B.C. ports. The inventory contains estimates of criteria air contaminant and greenhouse gas emissions over a 12 month period in 2005-2006. In addition to the more familiar sources of ship activity information, this inventory used activity data of unprecedented detail: Canadian Coast Guard vessel traffic control/tracking data at three to seven minute intervals, and a detailed engine and fuel survey enjoying a 68% response rate. This presentation will discuss the challenges, benefits and lessons learned using this unprecedented level of activity detail. It will also discuss boundary and duplication issues with the concurrent and overlapping Puget Sound Maritime Air Emissions Inventory. Emissions estimates (i.e. inventory results) will be presented and discussed.

1:55 "New Developments in the Emission Inventory of the Netherlands," P. Coenen, D. Heslinga and J. Hulskotte

The emission inventory in The Netherlands has a long history. In 1974 it was set up for the assessment of the emissions of pollutants into air and water of major industrial plants in the Netherlands. Over the years methodologies have been developed to estimate emissions of all industrial activities. From 1999 companies themselves make environmental reports from which the data are included in the inventory. Also non industrial sectors were included in the inventory such as agriculture, consumers and waste sector. At this moment the inventory covers all sources (industry, traffic and transport, agriculture, service sector, consumers and SME) of air pollution and water contamination. The inventory has an annual cycle resulting in one national database which is used to fulfill all (inter)national obligations to report data on emissions such as UNFCC and CLRTAP. The national database therefore includes all substances (acidifying substances, ozone precursors, greenhouse gases, PM10 and PM2.5 and hazardous pollutants).In recent years vast effort has been made to speed up and streamline the emission inventory data-process and the subsequent reporting from the database. By means of state of the art WEB technology national emission experts can upload all emission data to the database. After the necessary QA/QC procedures the database is published on the internet. Not only the emission figures but also graphics and maps are being presented based on the user preferences. In this way The Netherlands is able to meet the requirements of the Aarhus convention.

2:20 "Data Management and Emissions for a Port Landside Emission Inventory for the Vancouver Fraser Port Authority," B. McEwen and G. Olszewski

A Landside Emissions Inventory for over 100 marine facilities under the administration of the Vancouver Fraser Port Authority in British Columbia was completed in 2008. Data collection and determination of inventory boundaries were challenged by the wide spatial distribution of terminals in the region. In addition, many of the facilities did not have the resources to complete a thorough inventory of equipment needed to support emission estimates. To minimize a prohibitive amount of 'leg work' in capturing accurate data for cargo handling, trucking and rail activity, an excel questionnaire was developed and linked to an emissions inventory (EI) database. The EI database was configured with a matrix of EPA MOBILE and locomotive emission factors to link with trucking and rail activity input fields in the questionnaire. More significantly, the EPA NONROAD methodology and data tables were linked such that the NONROAD emissions model was mimicked internally, bypassing model defaults. The result was a largely automated, functional database EI model that was able to import a terminal's activity information, complete all emissions calculations and conduct accuracy checks based on fuel criteria. In addition, the estimation routines were complemented so that use of alternative fuels (e.g., biodiesel) could be handled. The EI model minimized manual calculation efforts and allowed more time to be spent on dialogue with terminal operators to improve activity level estimates. The database was linked with the input terminal questionnaires, facilitating scenario testing and forecasting, which was a required component of the EI project. The presentation will discuss the steps taken to create the database model and the iterative process undertaken to achieve reasonable activity estimates for each marine terminal.

2:45 Break

3:15 "Using Satellite Imagery for an Inventory of Erodible Vacant Land," F. D. Hall and W. F. Kemner

An inventory of native desert, disturbed vacant land, stabilized vacant land, and private unpaved roads in Clark County, Nevada is being developed using satellite imagery together with "on the ground" field observations and testing. The methodology for developing this inventory uses multispectral satellite imagery and ground truthing (field data collected on the ground used to "train" the computer algorithms to correlate spectral data collected by the satellite to actual conditions on the ground. An accuracy assessment is used to predict both user and producer accuracy to verify the correctness of the computer's predictions of actual ground conditions). At each ground truthing site, the drop ball test, the rock cover test, and the threshold friction velocity (TFV) test are performed. Site conditions such as types of vegetation and vegetation cover (height, density, and umbrella size) were noted. Satellite image data are used to map and analyze wind erosion areas based on multispectral data. This analysis is based on differentiating the spectral signature of erodible soil (disturbed surfaces) from signatures for desert vegetation and other non-erodible elements (e.g., rock outcroppings, other stabilized soil surfaces). Bare soil, washes, green and senescent vegetation, and significant rock outcrops are distinguished to assist in mapping wind erosion areas. In addition, traffic counts were conducted on unpaved roads to determine average traffic flow and emission rates.

3:40 "Hourly Biomass Burning Emissions Inventory Derived from Satellite Data," X. Zhang and S. Kondragunta

NOAA/NESDIS developed a new algorithm to derive biomass burning emissions that depends on various key inputs. The fuel loading (1 km) is developed from Moderate-Resolution Imaging Spectroradiometer (MODIS) data which includes land cover type, vegetation continuous field, and monthly leaf-area index. The weekly fuel moisture category is retrieved from AVHRR (Advanced Very High Resolution Radiometer) Global Vegetation Index (GVIx) data for the determination of fuel combustion efficiency and emission factors. The burned area is simulated using half-hourly instantaneous fire sizes obtained from the GOES (Geostationary Operational Environmental Satellites) Wildfire Automated Biomass Burning Algorithm (WF_ABBA) fire product. By integrating all these parameters, we estimated emissions of PM2.5 (particulate mass for particles with diameter < 2.5 m), CH4, CO2, N2O, NH3, NOX, and TNMHC every half hour since 2002. We investigated the spatial and temporal variation in the biomass burning emissions for these species. This algorithm will soon be implemented into operational stream so satellite-derived emissions can be routinely obtained on a daily basis for air quality modeling and emissions inventory applications.

4:05 "Webmapping Solutions for the Development of Emission Inventory Models," V. Gois, J. Neves and L. Nogueira

Inventory models at regional level should be developed taking into account the needs of the communities of air quality modelers and policy makers. Only this way Inventory models can become a useful and efficient tool. Most measures at regional and local level are spatially related. Therefore, policy makers want to define and apply measures upon specific actors – point sources, traffic – and at specific geographical locations. GIS systems are complex and require resource allocation and extensive training, although inventory users seldom need all the existing functionalities. The complete functional requirements of the vast majority of users can be covered with a geographical database and the ability to select and manipulate emission and emission conditions from geographical objects, either point sources, area sources and line sources. The Air Emission Inventory System of the Lisbon and Tagus River Air Quality Authority incorporates a very detailed traffic emission inventory, with information at every road link for an extensive urban area, as well as a detailed inventory model of point sources. This bottom-up approach is complemented to a top-down approach generating area sources for the remaining activities. Recent UE legislation and the existence of pervasive air quality problems made necessary the development of "Plans and Programs", a set of policies and measures for the region. The development of the Plans has been highly improved by a tool making the connection between the Inventory System and the Air Quality Models and that integrates the inventory model in a simple set of indicators that can be appropriately manipulated at geographical level, and used dynamically as input to an air quality model. In this situation, the manager can make parameter modifications via geographical restrictions directly applied to the model structure. Changes in linear, area and point sources contributions to the model are built using spatial queries on the database that will affect the air quality input database. The Web GIS solution that was developed combines Open GIS standards with innovative technologies for webmapping. Web map display uses the WMS (Web Map Service) standard produced by an open source web mapping server (UMN MapServer), which could be easily replaced by any WMS compliant Web GIS software. The geographical database is stored in Post GIS, an open source and Open GIS complaint database, providing the geographical storage and querying functionality. The exchange of data with air quality models is done entirely through XML.

4:30 "Detailed Operational Data as a Means to Improve Air Emissions Management," A. Martins, V. Schmall, R. Oliveria, B. Pikman and K. Weiss

Since 2004®,PETROBRAS has been tracking its air emissions using a comprehensive Management System – SIGEA – developed with ERM support and customized to cover all of its operations from well to tank. Five criteria pollutants (CO, PM, SO2, NOx, and NMHC) and three greenhouse gases (CO2, CH4, and N2O) are being tracked for each individual piece of equipment with a specific calculation protocol per type of equipment. Besides adopting published and internationally accepted calculation protocols, material balances and operational data are used – when available – to obtain better estimates of emissions. The use of stoichiometric calculations for combustion equipment provides a unique ability to determine mass emissions from continuous monitoring analyzers. Operational parameters like oxygen content and air temperature are used, for example, to correct NOx emissions from boilers and furnaces. More accurate data mean more accurate results and better tracking of any management action being implemented. A system like this demands a significant effort from operating staff to provide accurate data and, in return, provides a reliable measure of the consequences of each action taken. For example, the impact of reducing the air excess on NOx emissions is captured either by continuous monitoring or by a set of equations that express NOx formation based on operational conditions. Most equations are a combination of EPA protocols and experimental data.SIGEA® performs data-gathering either using automated data acquisition systems or manual friendly interfaces, and delivers emissions results (metric tones per unit of time) to corporate management systems that will consolidate all environmental performance indicators. It is a solution that provides products and accurate results that are useful at many different corporate levels, from negotiating for regional permitting to making commitments regarding greenhouse gas emissions reduction.

Session 2. Stationary Sources

Chairs: Lynn Barnes, SC DHEQ
Chris Swab OR DEQ

1:30 "Emissions of SO_2, NO_x, CO_2 and Hydrocarbons from Industrial Sources in Houston Measured by the NOAA WP-3," R. A. Washenfelder, T. B. Ryerson, E. L. Atlas, C. A. Brock, G. J. Frost, J. S. Holloway, J. W. Peischi, S. M. Schauffler, M. Trainer and F. C. Fehsenfeld

The Houston-Galveston urban area regularly exceeds the EPA's 85 ppbv O_3 standard. This area contains a number of large industrial sources, including facilities along the Houston Ship Channel and Galveston Bay. Together these comprise a 25-mile long complex of diversified public and private facilities, including a petrochemical complex that is among the largest in the world. The Houston Ship Channel is a major source of industrial pollution, emitting sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO_2), and volatile organic compounds (VOC). In addition to the Houston Ship Channel, a number of smaller petrochemical facilities in the Houston area also emit SO_2, NO_x, CO_2, and VOCs. Unlike a single large power plant, these industrial complexes consist of numerous sources that can be difficult to quantify in inventories. In order to evaluate and predict air quality in the Houston area, it is important to understand the magnitude and variability of these industrial sources, and how these sources are evolving over time. During September – October 2006, the NOAA WP-3 aircraft conducted research flights as part of the Second Texas Air Quality Study (TexAQS II). We examine measurements of NO_x, SO_2, CO_2, and speciated hydrocarbons from the Houston Ship Channel and isolated petrochemical facilities. These measurements are used to derive source emissions estimates, which are then compared to estimates in the 2004 TCEQ regulatory inventory. Ethene and propane are found to be major contributors to O_3 formation. High hydrocarbon emissions are typical for the Houston Ship Channel and isolated petrochemical facilities. Ratios of ethane / NO_x and propane / NO_x at the isolated petrochemical facilities exceed emission inventory values by factors of 10 – 50. These findings are consistent with results from the first TexAQS study in 2000.

1:55 "Quantification of Ethene Emissions from Petrochemical Industries in Houston, Texas: Large Disagreements with Emission Inventories," J.A. de Gouw, C. Warneke, S. te Lintel Hekkert, J. S. Holloway, D. D. Parrish, J. Peischl. T. B. Ryerson, J. Mellqvist, E. L. Atlas and A. Fried

Reactive alkenes from petrochemical industries are known to play an important role in the formation of ozone in Houston, Texas. In this work we developed a fast-response detector for ethane based on laser photo-acoustic spectroscopy (LPAS) and used it onboard the NOAA WP-3D aircraft to measure ethane in industrial plumes around Houston in the summer of 2006. The new LPAS instrument was evaluated by comparison with measurement results from the whole air sampler (WAS), and the two measurements were found to agree within the combined measurement uncertainties of +/- (200 pptv + 15%). Emission fluxes of ethane were estimated (1) by integrating the measured ethane concentration across the width of industrial plumes, (2) by multiplying the concentration with the orthogonal wind speed measured from the aircraft, and (3) by assuming that the emissions are homogeneously distributed across the height of the boundary layer as estimated using aircraft ascents and descents. The estimated ethane fluxes were compared with the results of simultaneous Solar Occultation Flux (SOF) measurements inside a mobile laboratory, and agreement within a factor of 2 was obtained. Previous work had indicated that current emission inventories underestimate reactive alkenes emissions in Houston by 1-2 orders of magnitude. These findings were confirmed both by the LPAS measurements onboard the NOAA WP-3D and the SOF measurements. Finally, the measured mixing ratios of ethane were compared between the results from 2006 and an earlier mission in 2000. In contrast with CO and ethyne, which are predominantly from traffic, ethane and its photoproduct formaldehyde showed the largest decreases between 2000 and 2006, suggesting possible reductions of approximately 40% in the industrial emissions of ethane?

2:20 "A Comprehensive Oil and Gas Emissions Inventory for the Denver-Julesburg Basin in Colorado," A. Bar-Ilan, R. Friesen, J. Grant and A. Pollack

The Western Regional Air Partnership (WRAP) and the Independent Petroleum Association of Mountain States (IPAMS) are co-sponsoring the development of a region-wide emissions inventory from oil and gas (O&G) exploration and production in the Intermountain West. This represents a Phase III inventory effort for O&G sources, building on two previous WRAP sponsored regional O&G inventories and considering the major geologic basins of O&G activity in the region. The first basin inventoried in Phase III is the Denver-Julesburg (D-J) Basin in north-central Colorado, which includes the Denver metropolitan area. This inventory considers a base year of 2006, the most recent year for which detailed production data exists. The inventory includes projections for future years 2010 and 2020 to be compared to the State of Colorado's emissions inventory used for upcoming Denver-area ozone SIP modeling and attainment planning analyses, and 2018 to be used for emissions analysis and haze/criteria pollutant air quality modeling purposes by WRAP, state, tribal, federal agencies, or other interested parties. The Phase III D-J Basin inventory was developed by incorporating the detailed database of state-permitted sources, and an inventory of unpermitted sources compiled using a detailed survey of the major O&G companies in the Basin. The resulting inventory accounts for all criteria pollutants from most major O&G source categories. This inventory represents a significant update to the Phase I and II inventories, considering all criteria pollutant emissions from O&G operations, and using an updated methodology for deriving future year emissions projections that include well counts and production forecasts.

2:45 Break

3:15 "New Methodology for Estimating Emissions from Residential Wood Combustion," R. Huntley, F. Divita, J. Van Bruggen and S. Colodner

Residential wood combustion (RWC) appliances (fireplaces, woodstoves, outdoor hydronic heaters, wood-fired furnaces, etc) have been shown to be significant sources of air pollution. The Environmental Protection Agency's (EPA) National Emission Inventory (NEI) includes emissions from RWC which in large part, come from state and local agencies. When a state does not submit RWC emissions to the NEI, the EPA uses data of its own to populate the missing data fields. For the 2002 NEI, approximately one half of the states did not submit emissions from RWC. The EIAG has updated the methodology it uses to estimate emissions from RWC for the NEI. The reasons for doing this are 1) to account for appliances not accounted for in the old methodology (e.g., outdoor hydronic heaters) and 2) to make the NEI methodology easier for states, local agencies and tribes to input their own location-specific knowledge (e.g., wood density, estimates of amount of wood burned per appliance) into the estimation methodology, and 3) to correct some known deficiencies in the existing NEI methodology, and 4) to make the methodology easier for modelers and others of like mind to pull appliance population data from the NEI. This paper will explain how EPA worked with a group of state, local and regional planning organization representatives to create the new methodology, describe and explain how the new methodology works, contrast and compare the new methodology to the old, and compare the 2005 emission estimates derived from the new methodology to several states estimates as a means of "ground truthing" the new methodology.

3:40 "Revised Interpretation of Residential Wood Combustion Survey Data Resulting in Emissions Estimates Reductions," C. Swab, S. Otterson and J. Stocum

The Washington Department of Ecology and Oregon Department of Environmental Quality worked together to re-interpret results from a 2000 Residential Wood Combustion (RWC) survey conducted for Idaho, Washington, and Oregon. Agency staff reassessed the population of wood burning devices. Changes were made to the emission inventory method to account for only those wood burning devices in which fuel was reported burned, excluding respondents who reported owning devices but did not report burning any fuel. The methodology change was used for the Oregon 2005 RWC inventory, and resulted in significant reductions in RWC emissions estimates as compared to the Oregon 2002 National Emission Inventory submittal. The 2005 Oregon emissions estimates were further reduced by the correction of an error in wood density calculations. Estimated emissions reductions ranged from 62% for benzene to 45% for total VOCs. This paper discusses the re-interpretation of the survey results, outlines the Oregon emissions inventory methodology, and presents the Oregon RWC emissions estimates for 2002 and 2005 for CO, VOC, PM2.5, NOX, benzene, and 15-PAH.

4:05 "Preparation of the 2005 Point Sources National Emissions Inventory," R. Oommen, D. Wilson and A. Pope

Every three years, the U.S. Environmental Protection Agency (USEPA) prepares the National Emissions Inventory (NEI), an air quality emissions inventory dataset that serves numerous stakeholders, including federal, regional, state, local, and tribal agencies. Uses of the NEI data include: evaluating emission trends; preparing inputs for air quality modeling; and evaluating the need for additional control technology standards. The NEI consists of stationary, mobile, and biogenic emission sources. Stationary sources can be classified as point or nonpoint area sources, whereas mobile sources are categorized as onroad or nonroad sources. At present, the NEI houses criteria and hazardous air pollutants. The purpose of this paper is to describe the compilation of the point sources portion of the 2005 NEI. A number of data sources, augmentation techniques, and quality assurance checks were used to prepare the point sources inventory. Over 70 datasets from state, local, tribal, and regional air agencies were the primary basis for the national inventory. Emissions, locational coordinates, and stack parameter data from EPA's Risk and Technology Review (RTR) Program are also considered a primary data source, as these high quality data have been peer-reviewed by numerous state agencies, industry, and trade associations. Additionally, EPA datasets from the Emission Inventory and Analysis Group (EIAG), the Sectors Policy and Program Division (SPPD), the Toxic Release Inventory (TRI), and version 3 of the 2002 NEI are blended and merged with the above primary data sources for source category and geographic completeness. Finally, emissions data from offshore oil and gas platforms operating in the Gulf of Mexico were included from the Minerals Management Services (MMS).

4:30 "Use of a PRTR Emission Inventory in Assessing the Benefits of Abatement Policies in Industry," T. Pulles and W. Appleman

This data set is a so-called Pollutant Release and Transfer Register (PRTR). EPER is in many respects comparable to the US Toxics Release Inventory. This paper will present the results of a recent study to asses the potential benefits of full implementation of emission abatement policies in power plants in the European Union Member States. The study compares emissions reported by the power plants at facility level with emissions estimated through linking to information obtained from a commercial database (Platts, http://www.platts.com/). This approach allows for estimating the expected emissions when all 450 power plants in the study would have installed combustion technologies that comply at least with the "Best Available Technologies" as defined within the European Union's IPPC Directive or with the emission limit values as set for new plants in the EU Large Combustion Directive. Comparison with the reported emissions shows that emissions would have been substantially lower (more than a factor of two for NOx and SO2) if the intended emission abatement would indeed have been implemented. The study shows a novel use of PRTR emission inventory data in assessing the potential benefits of existing environmental legislation. Key words Power plants; emission abatement policies; PRTR; policy implementation

Session 3. Global/International Issues

Chairs: Paulette Middleton, GEIA Ctr
Orlando Carbrera, CEC

1:30 "The GEIA-ACCNR Web Portal on Emissions," C. Granier, A. Guenther, P. Middleton and A. Mieville

GEIA, the Global Emissions Inventory activity, is an integrating project of the AIMES (Analysis, Integration and Modeling of the Earth System) project of the International Geosphere Biosphere (IGBP) program. Over the past four years, GEIA has established strong links with the ACCENT European network which coordinates the European activities on atmospheric composition change. The presentation will review the most recent activities of GEIA, the outcome of the workshops that were organized within GEIA, and more particularly the 2007 summer school, where the development of on-line e-working modules on emissions were discussed. We will also present the GEIA-ACCENT web portal on emissions, which provides an easy access and detailed information on existing databases of emissions. Several inventories, either at the global or at the regional scale, are publically available from the portal. We will present a selection of comparisons of these inventories, and the first steps we have taken for the organization for an assessment of emissions inventories.

1:55 "Air Emissions Inventory Data in Europe: New Perspectives," M. Adams, S. Cryan and A. Mourelatou

This information ranges from national emission inventory data officially reported by the European Union Member States, through to emissions reported by operators of industrial point source facilities. This paper looks at the base of existing information and describes several recent international initiatives which are designed to further improve the quality of the reported data and to modernize and simplify the collection, exchange and use of such data. Examples of such initiatives have included, for example, the introduction of an international inventory review process for national air emission inventories reported by countries, the substantial revision of the EMEP/EEA Air Pollutant Emission Inventory Guidebook (the European reference document providing experts with guidance concerning inventory methodologies and emission factors), and the provision of web-tools designed to facilitate reporting and ensure easier dissemination and user-access to emissions data than has previously been the case. Finally, several detailed illustrations of how reported emissions data are used in the international and European policy context to inform on air emission and air quality policy issues are also presented. This includes how inventory data is used for tracking progress of national emission reduction commitments and the assessment of the effectiveness of sectoral policies in terms of their impacts on air quality at the European scale.

2:20 "Overview of the CEC's North American Pollutant Release and Transfer Register and Emissions Inventory Efforts," O. Cabrera-Rivera

The North American Commission for Environmental Cooperation (CEC) is an international organization created by Canada, Mexico and the United States under the North American Agreement on Environmental Cooperation (NAAEC). The CEC's North American Pollutant Release and Transfer Register (NAPRTR), and the Air Quality Programs aim at providing a more complete picture of air pollutant emissions in North America to support decision making in Air Quality and the management of pollutant releases. The NAPRTR program collects and analyses pollutant releases information from the PRTR programs in the US, Mexico and Canada, fosters communications and cooperation among the three countries in working toward the institutionalization and improvements of their respective PRTR systems, and offers enhanced access to the information to all stakeholders for use in addressing environmental issues of concern at the local, national and trinational level. One of the objectives of the Air Quality Program is to insure that the capacity exists to develop comparable air emissions data for use in trans-border air quality planning, and enhancing the public access to air emissions information. One of the current projects under the Air Quality Program is the update of the 2005 Mexican National Emissions Inventory with methodologies compatible with those used in the US and Canada. The inventory project covers point, area, mobile and biogenic sources. This paper presents an overview of the CEC's North American PRTR and Air Quality Programs, and discusses the challenges of integrating North American air pollutant releases data.

2:45 Break

3:15 “An Inventory of Gases and Particles Emissions for the 1900-2000 Period,” C. Grainer, C. Liousse, B. Guillaume, A. Mieville, J. M. Gregoire and F. Mouillot

Since the beginning of the 20th century, large changes in surface emissions of atmospheric chemical species have occurred. Previous inventories have been developed of the past few years which describe the changes in emissions, but they have focused either on gaseous species or on particles and their precursors. We have developed a new inventory of emissions, which covers the 1900-2000 periods, and provides consistent emissions distributions of both gaseous species and aerosols. The species considered in our inventory are carbon dioxide (CO2) and methane (CH4), tropospheric ozone precursors, i.e. carbon monoxide (CO), nitrogen oxides (NOx) and volatile organic compounds (VOCs), and aerosols and their precursors, i.e. sulfur dioxide (SO2), and black and organic carbon. Our inventory provides emissions from both anthropogenic and biomass burning emissions at the global scale, with a 1x1 degree spatial resolution. We will provide details on the methodologies we have used to construct the inventory, the statistical data and emissions factors that have been used, as well as on other data such as vegetation maps. The distribution of emissions provided by the inventory will be compared with other available inventories at the global or the regional scale.

3:40 “Development of High-Resolution Emissions Inventories from Motor Vehicles for City-Level Air Dispersion Modeling in China – A Case Study,” H. Guo

Ambient air pollution is a major environmental problem in China. With annual vehicle population growth of above 20% in Chinese large cities recently, China faces severer motor vehicle pollutions. The State Environmental Protection Administration of China (SEPA) has identified motor vehicles emissions as one of the major sources of urban air pollution in China. As a result, regulators and decision makers are being required to invest large amounts of resources into managing and assessing roadway effects on air quality. To better quantify the impacts on air quality by motor vehicles or assess the effectiveness of control strategies, comparatively accurate and high-resolution emission inventories are very important as the inputs of air dispersion models. However, due to the limited database of motor vehicle activities (including VMT distributions, vehicle fleet age, type and technology distributions etc.) and lack of a Chinese own comprehensive emission model currently, city-level motor vehicle emissions are inadequately understood and quantified. In this paper, taking Hangzhou city as a case study, a method was developed based on limited database to estimate the spatial and temporal distributions of motor vehicle emissions. Combining on-site video tape traffic count statistics and I/M station database, the VMT distributions and distributions of vehicle age, type and technology classes operating on city streets were determined. The vehicle driving patterns were measured using GPS technology. International Vehicle Emission (IVE) model combined with GIS technology was used to develop high-resolution emission inventories of CO and NOx from motor vehicles in Hangzhou city in 2004. In addition, to evaluate the contributions from motor vehicle emissions, gridded emission inventories of CO and NOx from stationary sources were also developed based on the database of emission declaration forms from industries and environmental statistics data in Hangzhou city in 2004.Finally, these high-resolution emission inventories in Hangzhou were used as inputs of the AERMOD model to simulate the spatial concentration distributions caused by motor vehicle emissions. And the spatial distributions of emission concentration contributions were also developed to analyze the impact caused by motor vehicle emissions.

4:05 “Panel: Local and Global Assessments – the Art and Science of Integrating Inventories”

Local air quality is influenced by conditions nearby and far away, perhaps even around the world. At the same time, assessing and addressing global air pollution relies on proper characterizations of air emissions at local and regional levels. This panel outlines key concerns of integrating emissions data and discusses approaches to successfully assessing air quality issues from a local to a global perspective.

4:30 “Panel: continue

Poster Session 6:00 - 8:00 pm

1. "Development of an Ammonia Emission Inventory for the San Francisco Bay Area", E. K. Gilliland, D. C. Sullivan and S. B. Reid

2. "Comparison of Biomass Burning Emission Estimates", G. Pouliot and T. Pierce

3. "A Methodology to Constrain the Potential Source Strength of Various Soil Dust Sources Contributing to Atmospheric PM_{10} Concentrations in Europe", H. Denier van der Gon, E. Hendriks, M. Schaap, and A. Visschedijk

4. "Climate Change Emissions Inventories for Companies Reporting to Registries and Projects", D. Millar, M. Grossman and B. T. O'Neil

5. "High Resolution Emissions Inventories and the Carbon Cycle", G. Pétron, A. Andrews, G. Frost, A. Jacobson, W. Peters and P. Tans

6. "A Top-Down Compilation of State and Provincial Greenhouse Gas Emission Summaries and Projections: 1990, 2005, and 2020", L. Williams, B. Strode, S. Roe, T. Peterson and R. Strait

7. "Project Level Mobile Source Air Toxics Analysis: Loop-12 Case Study in the Dallas Fort-Worth, Texas Region," C. Klaus, M. Venugopal, K. Yu, S-K Park,

8. "On-Road Transport Emissions in the Metropolitan Area of Buenos Aires, Argentina", D. Gomez, L., Dawidowski and A. D'Angiola

9. "Aerosol Emissions from Commercial Shipping", D. Lack

10. "Alternatives and Tools for Motor Vehicle Emission Estimations in Mexican Cities", G. Echániz-Pellicer, V. Garibay-Bravo and J. A. Aguilar-Gómez,

11. "Minerals Management Service Gulf of Mexico Emissions Inventories", H. Ensz, D.Wilson, R. Oommen and R. Billings

12. "Integration of Vehicle Activity into Emissions Estimation Based on On-Board Measurements for Diesel Light-Duty Vehicles", M. C. Coelho, H. Zhai, H. C. Frey, N. M. Rouphail, and L. Pelkmans

13. "Recent Updates to the Smoke Modeling System and its Applications", B. H. Baek, Z. Adelman, A. Eyth, S. Arunachalam, A. Hanna, M. Houyoux, and M. Strum

14. "Emission Processing or Long-Term Regional Air Quality Modeling", C. Hogrefe, Jia-yeong Ku, G. Sistla and E. Zalewsky

15. "Emissions Processing Methodology for the New GEM-MACH Model", M. Sassi, L. P. Crevier, S. Ménard, G. Morneau, D. Niemi, P. Makar, W. Gong, and D. Fox

16. "Combining Software Tools to Post-Process Output from the Smoke Emissions Model", P. Barickman

17. "Emissions Modeling of Specific Highly Reactive Volatile Organic Compounds (HRVOC) in the Houston-Galveston-Brazoria Ozone Nonattainment Area," R. Thomas, J. Smith, M. Jones, J. MacKay and J. Jarvis

18. "Development of an Hourly Modeling Emissions Inventory from Several Sources of Regulatory Speciate Hourly Data for the Houston-Galveston-Brazoria Ozone Nonattainment Area," R. Thomas, M. Jones, B. Exum, D. Karp and J. MacKay

19. "Air Pollution from Past Operations Lead Smelters in Mitrovica," A. Syla and K. Berisha,

20. “Development of an Emission Database in XML and its Integration with a Geographic Information System into an Atmospheric Chemistry Model in Mexico”, A. Ortinez

21. “Speciate 4.1 - EPA's Database of Speciated Emission Profiles”, D. Mobley, L. Beck, Y. Hsu and F. Divita, Jr.

22. “Using Google Earth to Display Emissions Data”, J. Drukenbrod

23. “Developing a Web-Based CALPUFF Dispersion Model-Ready Air Emission Inventory”, K. O’Neill, R. Chapman, D. Chadder; R. Mintz and R. Barrett

24. “The EIS Gateway”, M. Husk

25. “Benefits and Overview of the Electronic Reporting Tool (ERT)”, P. Baker

26. “Environmental Knowledge and Assessment Tool (EKAT)”, T. Boguski, R. Green, L. Erickson, E. Keck and J. Fredkin

27. “Management System for Air Emissions – SIGEA – the Search for Corporate Sustainability”, A. Martins, V. Schmall and R. Oliveira

28. “Emission Inventory for Medellin City (Colombia)”, M. V. Toro, J. Serna, J. C. Gomez and C. Sanchez

29. “Characteristics of C2-C5 Hydrocarbon and Monoaromatic Compounds in the Air of Urban Raipur”, S. Chhattisgarh, S. Sharma and K.S. Patel

30. “Polycyclic Aromatic Hydrocarbon Distribution in Central India,” S. Sharma, K.S. Patel

Wednesday - June 4, 2008

Session 4. Emission Factors

Chairs: Roy Huntley, US EPA
Bob Betterton, WV DAQ

8:30 "Emission Factors for New Certified Residential Wood Heaters," J. E. Houck, L. Y. Pitzman and P. Tiegs

Woodstove changes out programs, which entail the replacement of old uncertified wood heaters with new lower-emitting EPA certified wood heaters, have become a recognized strategy to reduce ambient particulate levels. To assess the benefit of particulate emission reductions affected by changeouts, accurate emission factors for new model certified wood heaters are needed. Standards of performance (NSPS) for new residential wood heaters were promulgated February 26, 1988. The standards include test methods and procedures for particulate emission measurement. These test methods and procedures can best be described as "benchmark" and emission rates obtained from them are only loosely predictive of actual in-home emission factors. Independent of NSPS certification, the U.S EPA has also compiled emission factors for certified woodstoves in its AP-42 document. The particulate emission factors for wood stoves contained in the AP-42 document have not been revised since 1991 and are based on the earliest certified models or their prototypes with most measurements made as part of studies conducted in the late 1980's. Considerable improvements have been made in certified wood heaters and in the last two decades and improvements needed in the certification process have become apparent as well. A review of recent particulate data for certified stoves with recommendations for revising emission factors and the NSPS test methods and procedures to make them more predictive of real-world emissions are provided here.

8:55 "Emission Factors for Aged Uncertified Residential Cordwood Heaters," J. E. Houck, L. Y. Pitzman and P. Tiegs

Residential cordwood heaters have been documented as being appreciable contributors to emission inventories compiled in North America. In the United States, federal regulations required all wood heaters sold after July 1, 1990 to be certified for low particulate emissions. Because of the robust construction of cast iron and plate steel heaters, many uncertified cordwood heaters sold prior to July 1990 are still in service. However, after 18 or more years of use many show changes in efficiency and emissions primarily due to loss of air control. Deterioration of gasket materials, thermal warping of doors and air control systems, and breaches in the unit due to corrosion are responsible. Updated emission factor data for aged wood heaters are presented here to provide more accurate data for future emission inventories. Particulate, carbon monoxide, formaldehyde, benzene, methane, and polycyclic aromatic hydrocarbon (PAH) emission factors have been tabulated. The impact of the decrease in efficiency on effective emission factors, i.e., additional fuel required for a given heat demand, is also presented. Finally, as non-methane volatile organic compound (NMVOC) emissions are on the same order of magnitude as primary particulate emissions, NMVOC data and the contribution of secondary organic aerosols (SOA), formed from them, to overall air shed particulate levels are discussed.

9:20 "Development of Emission Factors for Pulp & Paper Mill Sources," J. E. Pinkerton and A. V. Someshwar

NCASI has developed emission factors for pulp and paper mill sources from a large body of emission test data. These factors and associated emissions information are widely used by NCASI member companies for air permitting, emission inventories, and SARA Section 313 reporting. In this paper, the procedures used to review stack sampling test reports, identify key factors affecting emissions, process test data, and perform statistical analyses will be described. Techniques for handling data sets with measurements below method detection limits and with potential outliers will be discussed. The format for presenting summary information for each factor, and the availability of direct links to underlying supporting data, will be presented.

9:45 Break

10:15 "Determination of Emission Factors from Commercial Marine Vessels," E. Williams, B. Lerner, P. Murphy, S. Herndon and M. Zahniser

Commercial marine vessels range in size from small fishing boats (20-30 meters in length) to extremely large container ships (>300 meters in length). These ships almost without exception use diesel engines for propulsion and auxiliary power generation. The larger ships, comprising bulk carriers, tankers and container carriers, utilize diesel engines that produce power in the 10 MW to 100 MW range. These engines typically consume heavy fuel oils, which are high in sulfur content (1%-4.5% by weight). These engines are also extremely efficient, converting essentially all of the carbon in the fuel to CO2, but also emitting NOx, CO, SO2, VOCs, and PM. During the Texas Air Quality Study of 2006 our measurements on board the NOAA research ship Ronald H. Brown allowed us to characterize the emissions from a large number of commercial marine vessels. The measurements provided the means to calculate mass-based emission factors for NOx, SO2, CO, and CH2O. With the information broadcast by these vessels over the Automated Information System, we have unequivocally determined the emission factors for over 200 vessels both at dock and underway. Our data largely confirm published average emission factors for NOx, SO2, and CO, but also show significant variability especially with NOx. We also report here an extensive data of CH2O emission factors. This talk will present those results and then use the data to show that emissions of NOx and SO2 from these vessels are non-negligible and, in some cases, can be comparable to large point-source emissions.

10:40 "An Introduction to Chapter 16: 'Methods for Estimating Air Emissions from Chemical Manufacturing Facilities'," A. Hatfield

Chemical processing plays an integral role to most manufacturing operations. Although each industry meets different manufacturing objectives, most industrial chemical processes contain one or more of the basic unit operations. These common operations are filling, heating, purging, depressurization, gas evolution, empty vessel purging, and vacuum age. Control devices are installed in the process vent line as a means of reducing the emissions before the exit vent gases are finally released. Process operations may be continuous and operate for long periods of time or they may consist of many discrete events and operate batch wise. Quantifying the air emissions that occur from a chemical process is much more involved than the air emissions from a boiler or other combustion operation (where stack gases are sampled and measured). Emissions that occur from a chemical process operation depend upon the solvents and other chemicals being used, the control devices present in the process vent line, and the specific unit operations that are followed. Chapter 16 was written to provide basic guidance for applying state of the art emission calculation procedures to the many unit operations found in chemical manufacturing. The purpose of this paper is to present an overview of these fundamental calculations.

11:05 "Determination of Urban VOC Emissions Ratios and Comparison with Inventories," C. Warneke, J. A. de Gouw, P. D. Goldan, W. C. Kuster, J. S. Holloway, E. J. Williams, D. D. Parrish, M. Trainer, F. C. Fehsendeld, S. Kato, E.L. Atlas, A. Baker and D. R. Blake

During the NEAQS-ITCT2k4 campaign in New England anthropogenic VOCs and CO were measured downwind from New York City and Boston. The emission ratios of VOCs relative to CO and acetylene were calculated using a method in which the ratio of a VOC with acetylene is plotted versus the photochemical age. The intercept at the photochemical age of zero gives the emission ratio. The so determined emission ratios were compared to other measurement sets, including data from the same location in 2002, canister samples collected inside New York City and Boston, aircraft measurements from Los Angeles in 2002 and the average urban composition of 39 U.S. cities. All the measurements show fairly good agreement. The measured emission ratios also agree well with vehicle exhaust data indicating that major sources of VOC's in urban areas are automobiles. A comparison with an anthropogenic emission inventory shows a rather poor agreement, especially for the C2-C4 alkanes and most oxygenated species. The inventory overestimated toluene for example by almost a factor of three, which caused an air quality forecast model (WRF-CHEM) using this inventory to over-predict the toluene mixing ratio by about a factor of three as well.

11:30 "African Combustion Emissions," C. Liousse, E. Assamoi, B. Guillaume, J. M. Gregoire, H. Cachier, B. Guinot, R. Rosset, A. Konare, C. Granier and A. Mieville

Fossil fuel and biofuel emissions over Africa are expected to be large in a near future. A new inventory has been tentatively constructed typical of the years 2000-2005 by adjusting fuel consumption and activity sectors to regional specificities and by including new emission factor measurements from our last African campaign (example with African two strokes). The methodology is based on the most recent global fossil fuel and biofuel emission inventories given by Junker and Liousse, (2006). Our future projections for the year 2030 are based on energy consumption forecasts by the Prospective Outlook on Long-term Energy Systems (POLES) model (Criqui, 2001) for a "reference" scenario, where no emission controls beyond those achieved in 2003 are taken into account, and for a "clean" scenario where possible and planned political measures for emission control are assumed to be effective. The resulting gas and particle national emissions are distributed within each country in proportion to improved rural/urban population densities for present and future. In addition, as presented in Liousse et al., (2008), daily emission inventories of gases and particles from biomass burning have been developed specifically for Africa over the period 2000-2007, at a resolution from 1kmx1km to 1°x1°. These inventories have been developed using L3JRC burnt area data based on SPOT-VGT satellite for the 2000-2007 period and GLC vegetation maps (Global Land cover, Bartholomé and Belward, 2005).Emission budgets with relative contribution of the different combustion sources will be discussed and compared with previous available inventories of gases and particles.

Session 5. Greenhouse Gases

Chairs: Andrea Denny, US EPA
Leif Hockstad, US EPA

8:30 Panel: Corporate, state and municipal representatives will describe experiences and lessons learned in creating a greenhouse gas inventory, including reasons for inventory development, data availability and quality, inventory uses, challenges, and future plans. There will be ample time for questions from the audience.

8:55 Panel: continue

9:20 Panel: continue

9:45 Break

10:15 "Improving the Transportation Component of State Greenhouse Gas Inventories," J. Davies, M. Grant and F. Gallivan

As climate change is gaining more attention with state and local policy-makers, states have been developing climate action plans, identifying strategies to reduce GHG emissions. Since transportation is a major source of GHG emissions, many states are considering policies and actions to reduce GHGs from the transportation sector. Accordingly, it is important for states to have credible and accurate inventories of GHG emissions in order to characterize existing sources, develop accurate projections of future emissions, and to analyze strategies and policies to reduce GHGs. While existing state inventories provide a useful basis for analyzing many policies, they commonly lack sufficient detail to address transportation planning and policy questions. This paper describes existing practices and challenges in developing the transportation component of state inventories. It describes methods for developing more detailed and accurate transportation estimates, which can improve their value for policy analysis and enable better communication with the public and decision-makers. An introductory section of the paper will provide a brief overview of the development of GHG inventories over the past 20-30 years, including the history and policy context for both U.S. and state inventories. It will also address the transportation component of state GHG inventories, including the methods used for developing the transportation component of GHG inventories. It will outline basic conventions for estimating GHG emissions from the transportation sector, including methodologies focused on fuel types. A second section of the paper will describe the key challenges associated with transportation component of GHG inventories, especially the need for accurate disaggregation by mode and vehicle type, and the significance of this information for policy analysis. It will describe common obstacles to achieving this level of detail. A third section of the paper will recommend ways that state agencies can improve the quality of state-level transportation GHG inventories. It will discuss the potential use EPA's MOVES model in conjunction with state fuel data. Other prospective improvements include the development of more explicit standards and guidance for state inventories. Potential improvements in lifecycle emissions estimates will also be discussed.

10:40 "Comparison of GHG Emissions Inventories with Different Reporting Protocols," G. Pelletier

With an increasing focus on greenhouse gas (GHG) emissions, climate change, and green business practices by consumers, the media, and stakeholders, organizations must decide whether to create emissions inventories of their GHG emissions. While such reporting was originally a purely voluntary decision, a gradual shift is being made towards mandatory reporting, adding another layer of complexity. Organizations with operations in multiple states may be required to report emissions for similar facilities and operations to more than one reporting registry. For example, if a company has operations in both California and New York, it may find itself reporting under CCAR, AB 32, and RGGI standards. This paper strives to compare and contrast the various reporting protocols and methods for developing GHG inventories to evaluate any differences in emissions inventories. The effects that organizational boundaries may have on an emissions inventory will also be evaluated to evaluate how a shift from voluntary reporting under CCAR to mandatory reporting under AB 32 may affect an organization's carbon footprint. Some companies may be required to shift reporting from an equity share basis to facility-level reporting, resulting in a drastically different emissions profile. Examples will also be shown describing the ways in which different organizational boundaries (e.g., equity share, financial control, or operational control) will affect an emissions inventory.

11:05 "Double-Counting in Municipal Greenhouse Gas Emissions Inventories," L. M. Miller

City A is conducting a greenhouse gas (GHG) emissions inventory. A power plant in City A is determined to emit for 1000 tons of carbon dioxide annually from its electricity production. These 1000 tons of Scope 1 emissions are included in the city's inventory. A large business in purchasing electricity generated from this same power plant – the amount of electricity they purchase annually is the equivalent for 10 tons of Scope 2 emissions annually. In this scenario, 1% of carbon dioxide emissions from the power plant are being double counted. Both the business and "City A" are correctly accounting for their emissions, yet the power plant's emissions are still being double counted. What if the power plant itself conducted a GHG inventory? These emissions could then be triple counted. This issue of double counting is increasingly becoming an issue with a lack of national guidance on greenhouse gases and climate change and the increasing number of cities joining the U.S. Conference of Mayors Climate Protection Agreement. In the three years since it was formed, over 780 cities have signed on to this agreement. Under this agreement, participating cities commit to strive to meet Kyoto Protocol targets – reduce GHG emissions by 7% below 1990 levels by 2012. As a result, hundreds of U.S. cities are now working on baseline GHG emissions inventories to determine where their emissions stand now before they begin to figure out how to make reductions – but how can this be done without double counting other residential, commercial, or industrial emissions? This paper will examine the various issues regarding double counting and GHG emission ownership until there is clear national guidance on greenhouse gas regulation.

11:30 "Realizing Residential Building Greenhouse Gas Emissions Reductions: The Case for a Web-based Geospatial Building Performance and Social Marketing Tool," H. S. Knowles, III

As the United States joins the global effort to mitigate climate change, we will need to develop and deploy a variety of tools for catalyzing, monitoring, and verifying greenhouse gas (GHG) emissions reductions in diverse economic sectors. This presentation proposes a Web-based geospatial building performance and social marketing tool that will: (1) effectively and transparently track the GHG emissions associated with energy and water consumption in residential buildings; (2) provide tailored feedback to foster household behavior change toward energy conservation and efficiency improvements; (3) speed the integration of building performance and GHG emissions reductions into property valuations and real estate transactions; and (4) standardize residential GHG emissions data sharing among utility providers and within carbon markets. In making the case for the tool, this presentation will address a range of questions about the science, technology, and market factors currently converging in its support. Why do emerging carbon markets and energy efficiency policies and programs in the European Union and the United States necessitate transparency in GHG emissions data at the household level? What does the growing body of social science research suggest about social networks, social norms, and maximizing behavior change interventions in energy efficiency and conservation? How is the tool unique within the industry and in what ways does it expand upon a foundation of current information technologies? How will the tool interface with existing third-party green building programs such as the U.S. EPA ENERGY STAR®, the U.S. EPA WaterSenseSM, and the U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Rating System? What will utility providers, building professionals, REALTORs®, and homeowners respectively gain from utilization of the tool? Finally, what collaborative partners and financial investments would be needed to develop and deploy the tool?

Session 6. Emission Inventory Preparation for Modeling

Chairs: Marc Houyoux, US EPA
Rich Mason, US EPA

8:30 "Generating an Hour-By-Hour Model-Ready Marine Emission Inventory," J. W. Boulton, M. Van Altena, D. Devine, M. Lepage, C. di Cenzo and A. Green

This paper provides an overview of the tools and techniques used to develop hourly, SMOKE model-ready emission inputs for marine vessels entering and leaving the Port of Vancouver in British Columbia, Canada. It also presents some of the pitfalls and uncertainty in the approach and provides a brief overview of preliminary results from the air quality modeling exercise. The authors were provided a unique dataset, containing more than four million vessel track records from the Vancouver Chamber of Shipping. Detailed vessel information (e.g., vessel type, voyage ID, location, timestamp, etc.) and activities (engine load by engine class, fuel, etc.) was provided at high spatial and temporal resolution (i.e., minute-by minute in some cases) for an entire one-year period (2005). The data were imported into a SQL database and then manipulated using a variety of GIS and database techniques to arrive at hourly emission files (CEM-like) for the 4 km resolution SECA model domain being assessed using SMOKE / CMAQ. Results from the air quality modeling indicate that although time consuming to prepare and computationally expensive to model, the adoption of high spatial and temporal resolution emissions inputs affects the overall model performance for a number of chemical species, especially when being modeled at relatively high spatial resolutions (e.g., 4 km or finer).

8:55 "Emissions Processing and Sensitivity Air Quality Modeling of Category 3 Commerical Marine Vessel Emissions," R. Mason, P. Dolwick, E. Kinnee and M. Wilson

The Environmental Protection Agency (EPA)'s Office of Air Quality Planning and Standards (OAQPS) and Office of Transportation and Air Quality (OTAQ) developed a methodology to convert ocean going Class 3 vessel emissions from a fine-grid ASCII raster dataset to a format that the Sparse Matrix Operator Kernel Emissions (SMOKE) processor could accept. The dataset is part of a SOx Emissions Control Area (SECA) analysis encompassing much of the northern hemisphere between the central Pacific and western Atlantic and consists of Commercial Marine port and inter-port Class 3 (C3) vessels, defined by EPA as having displacement greater than 30 liters per cylinder. EPA agreed to use the point source ORL format with average stack parameters used for all grid cells. The biggest challenge was converting the ASCII raster dataset into SMOKE ORL format, with accurate location coordinates and U.S. state-county FIPs where appropriate. This paper outlines several activities: 1) the pre-processing steps required to convert the SECA ASCII raster dataset to SMOKE ORL format; we will also discuss some of the methods we created using GIS and other software that increased processing efficiency, 2) the SMOKE settings required to process the SECA C3 emissions, and the replacement of the existing C3 emissions in the (Version 3 of the) 2002 National Emissions Inventory modeling platform, 3) comparison of SMOKE gridded C3 emissions from SECA and the 2002 NEI, and 4) comparison of SECA and 2002 NEI air quality estimates from the Community Multiscale Air Quality (CMAQ) model. We will also discuss the quality assurance of the SECA emissions for the year 2020 base case and several "zero-out" sensitivity model runs.

9:20 "Converting Gridded Inventories to ORL Format for Processing with SMOKE," Z. Adelman, L. Ran, A. Zubrow and T. Sfetsos

We will introduce the methods and a set of tools for converting gridded emissions inventories to political unit totals, such as state or country totals. Using the open source GIS functions of the Spatial Allocator; we demonstrate how to overlay Shape files of political boundaries over gridded inventories. By formatting the political unit totals to an IDA or ORL format it then becomes possible to import these data into an emissions processor, such as SMOKE, and allocate the data to a model grid using spatial surrogates. This approach facilitates the processing of gridded inventories for air quality modeling by allowing for greater flexibility in the application of spatial, temporal, and chemical profile information to gridded datasets. It also presents an improvement of the spatial distribution of low-resolution gridded inventories by allowing these data to be allocated to different model grids and projections using local spatial attributes available in Shape files. After presenting the techniques and tools to perform these operations we will present comparisons of emissions allocated to different grids using this approach versus linear interpolation. A range of cases for both North America and Europe will be compared and analyzed.

9:45 Break

10:15 “Development of an Air Emission Inventory for the Western Arizona Sonora Border AirQuality Study (WASBAQS): Part I - U.S. Emission Inventory,” G. Mansell, J. Grant, A. Bar-llan, A. K. Pollack, M. E. Wolf and P. G. Fields

Since 2001, AIRPACT has provided daily forecasts of photochemical pollutants for the Pacific Northwest. In AIRPACT-3, 12-km MM5 forecast meteorology flows through the MCIP meteorological processor to both a SMOKE-based emissions subsystem and to the CMAQ model (Chen et al., 2008). CMAQ is run in parallel on multiple processors in a Linux system, with results being visualized for display on the project web site. Chen et al. found that for the period of August—November 2004 for PM2.5, evaluating AIRPACT-3 results against EPA-AQS observations resulted in Fractional Bias of 3% and Fractional Error of 59%. Additionally, forecast results for PM2.5 and ozone can be compared in greater specificity and detail against AIRNow-reported values interactively by use of a flexible web-application. Considering the forecast system performance as documented, we are seeking through several ongoing efforts to investigate myriad sources of error in the AIRPACT-3 system. The accuracy of AIRPACT-3 forecasts for PM2.5 is constrained by multiple limitations including: the accuracy of the meteorological forecast, the accuracy of the emissions inventory, and uncertainties in the chemical and physical sub--models. An area of special interest is PM2.5 forecasting for small towns in winter conditions. Specifically, for small towns with significant residential wood burning and particularly in areas of complex terrain during the winter season, AIRPACT-3 is seen to predict wood smoke PM2.5 poorly. We hypothesized that our current SMOKE-implemented simple temporal allocations of wood burning emissions may not capture well the day-to-day variability of emissions production, and that coupling to forecast temperatures might improve the PM2.5 forecast for such towns. Alternatively, our 12-km meteorology may not resolve the local conditions, such as mixing height, adequately. Or both problems may contribute substantially to these errors. This project seeks to use forecast temperatures to estimate PM2.5 residential wood burning emissions, in lieu of the current temporal allocation approach as implemented via SMOKE. In another current project, a 1-km AIRPACT-3 system is being tested for complex terrain. Thus, in this project, forecast hourly ambient temperatures are being used, in conjunction with climatological hearing degree days (hours), to re-allocate the current emissions inventory for residential wood burning for CMAQ use. By increasing the temporal realism of wood smoke emissions, we hope to improve our understanding of the important sources of error, between model scale and emissions, for AIRPACT-3 capturing the behavior of PM2.5 for such situations as small towns in complex terrain.

10:40 “Development of an Air Emission Inventory for the Western Arizona Sonora Border AirQuality Study (WASBAQS): Part 2 - Mexico Emission Inventory,” G. Mansell, J. Grant, A. Bar-llan, A. K. Pollack, M. E. Wolf and P. G. Fields,

In response to concerns about high particulate matter (PM) and air toxics concentrations that have been measured along the U.S./Mexico border, the Arizona Department of Environmental Quality(ADEQ) is conducting the Western Arizona-Sonora Border Air Quality Study (WASBAQS) which’s the third in a series of studies of pollution along the Arizona/Mexico border. The principal objectives of the WASBAQS are to: (1) Fully characterize the gaseous and particulate air pollutants, (2) Estimate the risk to human health for the populations of Yuma, Arizona; San Luis Río Colorado, Sonora; and rural northeastern Baja California areas, and (3) Evaluate proposed control strategies to improve air quality in the border region of southwest Arizona, southeast California, and Mexico (states of Sonora and Baja California) (WASBAQS Study Area). The WASBAQS seeks to achieve these objectives in four phases: 1) air quality monitoring, 2) development of a gridded emissions inventory, 3) air quality modeling and control strategy evaluation, and 4) risk assessment. The emission inventory includes estimates of all criteria pollutants, ammonia, particulate matter and hazardous air pollutants (HAPs) for calendar year 2005. All relevant emission sources within the study area were considered, including point sources (those emitting 10 or more tons of a relevant pollutant per year), area sources (e.g., agricultural tillage, pesticide and fertilizer usage, and disperse sources of VOCs such as gasoline dispensing facilities, etc.), on-road mobile sources (i.e., tailpipe exhaust, tire and brake wear, road dust from vehicles traveling on paved and unpaved roadways),and nonroad mobile sources (e.g., lawn and garden equipment, agricultural equipment, etc.). The inventory also includes emissions from wildfires and windblown fugitive dust. Where practical and available, local data sources and source-specific information were incorporated into the inventory. In addition, HAP emissions estimates were developed using speciation data from the most recent version of the U.S. EPA’s SPECIATE database. The geographic extent of the inventory includes portions of Yuma County (AZ), Imperial County (CA), and the northern portions of the Mexican states of Sonora and Baja California. This paper discusses the development of the WASBAQS emissions inventory for the U.S. portion of the study domain. In addition, for certain source categories (i.e., windblown fugitive dust and ammonia), both the U.S. and Mexican portions of the domain are estimated as a whole – the development of emission estimates from these sources are also presented and discussed in this paper.

11:05 “Emissions Modeling of Specific Highly Reactive Volatile Organic Compounds (HRVOC) in the Houston-Galveston-Brazoria Ozone Nonattainment Area”, R. Thomas, J. Smith, M. Jones, J. MacKay and J. Jarvie

The 2006 Texas Air Quality Study (TexAQS II) confirmed many of the results from the 2000 Texas Air Quality Study (TexAQS 2000). Both of these studies rank among the most extensive and comprehensive studies of their kind undertaken to date. Chief among many important findings was the discovery of the role played by certain light olefins in the rapid, intense formation of ozone in the Houston-Galveston-Brazoria (HGB) ozone nonattainment area. Atmospheric concentrations of species such as ethylene and propylene were often found to be many times larger than could be explained by reported emissions inventories. Successfully modeling pollutant concentrations observed during the study necessitated adjustments to these reported emissions. As a consequence of these findings, in 2001, the Texas Natural Resource Conservation Commission (now Texas Commission on Environmental Quality) began developing regulations targeting specific highly-reactive VOCs (HRVOCs). Adjusting the modeling inventories to account for unreported HRVOC emissions and later test-driving controls on emissions of these specific compounds presented a set of unique challenges to emissions modelers, since emission processing software typically is not designed to apply adjustments or controls to individual VOC species. This paper describes a set of procedures developed by TCEQ which allowed us to successfully adjust and control (in processing for the photochemical model) emissions of individual hydrocarbon species in the TexAQS 2000 modeling episode. This paper also provides an introduction to ongoing efforts to reconcile more recent inventories with ambient measurements made at twelve automatic gas chromatographs (auto-GCs) currently operating continuously in the HGB nonattainment area

11:30 “Modeling of Columbia River Gorge Emissions,” J. G. Wilkinson, C. Swab, U. Nopmongcol, E. Tai, C. Emery and P. Mairose

The emission inventory is a key component of any air quality modeling exercise. For the Columbia River Gorge National Scenic Area Air Quality Study (Gorge Study), the Sparse Matrix Operator Kernel Emissions Modeling System (SMOKE) was configured to generate 2004 base year and 2018 future year model-ready emissions for two specific haze episodes occurring in August and November 2004. Hourly emission were estimated for point, area, non-road mobile, on-road mobile, and fire source emissions on a 36/12/4-km grid system, though we focus on the 04 km grid emissions in this paper. Criteria pollutant emissions were speciated according to the carbon bond (CB4) chemical mechanism with particulate matter (PM). Certain emission subcategories (e.g., electric generating units, on-road mobile sources, fires) were processed through SMOKE in separate streams in order to support source apportionment applications and to allow maximum flexibility in developing and applying alternate strategies in the modeling. Specialized processing was conducted for certain source categories to provide updated and/or day-specific emission estimates for the episodic conditions modeled in this study: large industrial point sources, wildfires, some prescribed fires, Mt St Helens volcanic emissions, on-road mobile sources, non-road mobile sources, biogenic, wind-blown dust, and agricultural ammonia. Extensive quality assurance (QA) was performed on the emissions. As a result of the QA process, numerous issues were identified and corrected, among which were the following: Reduction in Residential Wood Smoke: Annual fine PM emissions from residential wood combustion in Oregon and Washington were found to be overstated by a factor of two, based upon a revised interpretation of a 2000 Residential Wood Combustion survey conducted in both states. Increase in Agricultural Ammonia: Based on a detailed scrutiny of the Oregon and Washington ammonia inventories against recent emission factors published in the literature, two major issues were identified: (1) ammonia emissions from confined area feeding operations (CAFO) were understated by factors of 1.5 to approximately 4; and (2) ammonia emissions from fertilizer application were understated by factors of 2.5 to 3.Application of Canopy Escape Factors: to account for near source removal of fugitive dust such that the air quality model “sees” only about 25% of the estimated PM emissions from fugitive dust. This paper describes the emissions quality assurance (QA) process, the Microsoft Excel reporting and QA tool that resulted from this study, and the results of the QA process.

12:00 Lunch

1:30 “Development and Application of the High Elective Resolution Modeling Emission System (HERMES): A Multi-Pollutant High-Resolution (1km2-1hr) Emission Model for Spain,” J. M. Baldasano, L P. Guereca, E. Lopez, S. Gasso, P. Jimenez-Guerrero

This work presents the results of the development and application of the High Elective Resolution Modeling Emission System (HERMES). HERMES generates the emission inventory for Spain, taking the year 2004 as reference with a temporal resolution of 1-hr and a spatial resolution of 1 km2 considering both anthropogenic (power generation, industrial activities, on-road traffic, ports, airports, solvent use, domestic and commercial fossil fuel use) and biogenic sources (vegetation), using a bottom-up approach, up-to-date information and state-of-the-art methodologies for emission estimation. HERMES has been implemented in a supercomputing facility (the Mare Nostrum supercomputer hold by the BSC-CNS) in order to improve the intensive calculation time required by the resolution applied. HERMES is capable of calculating emissions by sector-specific sources, following the European Environmental Agency’s Selected Nomenclature for Air Pollution (SNAP) for emitting activities; or by individual installations and stacks. Total annual emissions (obtained by the addition of hourly sectorial emissions) were estimated as follows: NOx, 941 kt; NMVOCs, 1025 kt; CO, 1236 kt; SO2, 2001 kt and TSP, 198 kt; which are distributed principally in the greater areas of the main cities (Madrid and Barcelona), highways and large point sources. NOx, SO2 and PM2.5 highly correlate with the power generation by using coal, registering higher emission levels during summertime due to the increase of electricity demand by cooling systems. NMVOCs show high correlation with temperature and solar radiation (mainly as a consequence of the important weight of biogenic emissions) causing the maximum emissions during the daylight hours of summer months. CO emissions are mostly influenced by the on-road traffic; consequently the higher emissions are achieved in summer because of the increase of daily average traffic during holidays. The most significant emission sources are combustion in energy generation industries (46%) (principally when coal is used as fuel), on-road traffic (31%), biogenic sources (10%) and combustion in manufacturing industries (7%). The high quality emission inventory generated for Spain during the year 2004 by HERMES might be used for both scientific and regulatory/policy purposes, playing also a fundamental role in air quality modeling systems for Spain and Europe. In this sense, the inventory generated with HERMES emission model has been successfully integrated within the Spanish Ministry of the Environment’s air quality forecasting system (Caliope project), being the emission core for the validation and assessment of air quality simulations in Spain for the year 2004.

1:55 “Using SMOKE from the Emissions Modeling Framework,” M. Houyoux, C. Allen, A. Beidler, A. Zubrow and R. Mason

The EPA Office of Air Quality Planning and Standards (OAQPS) has developed an Emissions Modeling Framework (EMF) that it is using to perform emissions modeling for numerous air quality modeling efforts. The authors have linked the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system to the EMF for managing SMOKE input data and SMOKE runs for several modeling cases. We describe our use of a SMOKE-EMF linkage to create model-ready emissions for CMAQ evaluation using annual simulations of 2002, 2003, 2004, and 2006. In addition, we describe how SMOKE and the EMF are linked, running SMOKE from the EMF interface, additional emissions modeling products arising from the linkage, and further automation of quality assurance methods.

2:20 “Improving Emission Projections for Stationary Sources,” L. Chappell and A. Bollman

The EPA routinely conducts forecasts of emissions inventories to assess the benefits and costs of air regulatory programs. Analysis of air programs requires forecasts of emissions for all relevant source categories. The EPA has begun a process to improve the future-year forecasts methods for stationary sources excluding electric generating units (EGUs). The plan for improvements includes new methods and approaches for point and non-point sources. For both point and non-point source categories, the EPA is prioritizing its new forecasting approach to focus upon sectors that are high criteria pollutant emitters relative to total nationwide emissions. For the point sources, the EPA has undertaken a statistical analysis of historical emissions to better understand the relationship between emissions, economic factors, technological change and emission control programs for key industrial source categories such as pulp and paper manufacturing, petroleum refining, cement manufacturing, and other categories. This paper will illustrate a new forecasting approach for one sector, pulp and paper manufacturing. For non-point sources, EPA’s objective is to identify new forecast methods that yield projections data that more closely correlates with a category’s emissions-producing activity. Case study source category examples will demonstrate the effect of the improved methods on future year emission estimates. This paper will conclude with a discussion of additional areas of focus for future efforts to improve EPA’s non-EGU stationary source emissions forecasting capabilities.

Session 7. Air Toxics

Chairs: Anne Pope, US EPA
Regi Oommen, ERG

1:30 "Air Toxics Analysis—Particularly Metals," K. Hagelstein and J. Heinze

The objective of this paper is to provide a current analysis of metal particulate emissions. The analysis will identify natural and industrial sources, environmental standards, pollution trends, and controls of particulate emissions. Since the majority of metal emissions originate from metal industries (Primary Metals SIC33XX), current environmental and worker assessments of exposures from metal industries will be addressed. For example, metals emissions from metals industry include selenium compounds which are not assessed by OSHA and are now greater than mercury emissions. The toxicity of particulate metals are characterized by inhalation exposure limits, risk-based concentrations, drinking water standards, solid waste toxicity leaching characteristics, and other health-based evaluations. These health-based characteristics of metal compounds will be summarized and an overall environmental hazard ranking systems for ten metals will be presented. The most recent biomonitoring studies have provided urinary metal concentrations for assessing background metal exposures of thirteen metals for USA populations. The increasing urinary metal concentrations are examined (1999 to 2002) and the potential bioaccumulation of metals such as cadmium, are noted. Biological exposure indices for metal compounds are examined with respect to worker specific monitoring data. Based on current data gaps identified, exposure assessments and emissions monitoring of indicator metal particulate compounds (arsenic, cadmium, mercury, lead, and selenium) are recommended for the recycling and metals industries.

1:55 "A Comparison of Toxicity-Weighted Emissions and Ambient Risk Calculations," R. Oommen, D. Dayton, J. Siwft, A. Pope, J. Hemby and M. Jones

The identification of anthropogenic emission source and source categories significantly contributing to potential health risks is challenging for state, local, and tribal agency air quality managers. Reductions in hazardous air pollutants (HAP) emitted in the largest amounts may not necessarily translate into significant reductions in health risk because the toxicity of HAPs varies by pollutant. For example, based on EPA's 2002 National Emissions Inventory (NEI), ethylbenzene emissions are more than four times greater by mass than acrolein emissions nationally. However, according to EPA's National Air Toxics Assessment (NATA), acrolein is 50 times more toxic in terms of no cancer risk than ethylbenzene. Thus, it's important to design reduction strategies that take into account the toxicity as well as the mass of the targeted emissions to maximize the resulting health benefits. This paper uses the 2002 NEI (comprised of point, area nonpoint, onroad, nonroad, and biogenic sources for every county in the United States) and explores a toxicity-weighting approach developed by EPA in identifying source categories that may contribute the greatest health risk. In addition, the results of prioritization using this toxicity-weighting emissions approach are compared to those from NATA modeling data and ambient monitoring risk results for select areas across the country.

2:20 "Estimating Background Concentrations for NATA02," J. Hemby, T. Palma, A. Pope, M. Strum, M. McCarthy and H. Hafner

The National Air Toxics Assessment (NATA) is an ongoing effort by the US Environmental Protection Agency (EPA) to identify and prioritize air toxics, emission source types, and locations that are of greatest potential concern in terms to population risk. The most recent NATA estimates concentrations of air toxics by census tract in the United States in 2002. The modeling methodologies in the national-scale assessment estimate long-term outdoor concentrations of air toxics attributable to 2002 anthropogenic, or human-generated, emissions. However, the NATA modeling does not estimate outdoor concentrations of air pollutants attributable to long-range pollutant transport, unidentified emission sources, and natural emission sources. These "background" contributions can be significant for some air toxics and should be accounted for to accurately model concentrations. For NATA, background concentration estimates are defined as those concentrations reflecting transported contributions from farther than 50 km, unidentified emissions sources, and natural emissions sources. This paper describes the two methods were used to develop estimates of background air toxics concentrations for the NATA 2002 and the resulting background estimates. The first method relies on ambient air toxics measurements (ambient-based method) and the second method relies on HAPs emission inventory data (emissions-based method). The ambient-based method is preferred because the background estimates are based on measured air toxics concentrations throughout the United States. However, reliable ambient measurements are not always available for every pollutant of interest. Therefore, an emissions-based method was developed to handle those pollutants with inadequate ambient measurements.

2:45 Break

3:15 Panel: The Risk and Technology Review Process – A Collaborative Approach between the EPA, State/ Local agencies, and Industry.

The EPA's Risk and Technology Review (RTR) is an effort to evaluate risk from toxic air emissions after the application of control technology as required by the Clean Air Act (CAA). As part of this effort, the EPA's national emissions inventory (NEI) underwent a review and correction process. The reminder of this afternoon session will consist of a panel of speakers representing federal, state, and industrial perspectives who will describe their specific organizational roles in the RTR NEI review process, their collaboration with other organizations, and the challenges and successes. The panel will begin with the federal perspective.

3:40 Panel: continue (state agency perspective)

4:05 Panel: continue (sector approach - federal perspective)

4:30 Panel: continue (sector approach – industry perspective)

Session 8. Tools – Emissions Data Sharing & Assessment

Chairs: Martin Husk, US EPA
Mark Van Soestbergen, ICBE

1:30 "Aligning the Data Planets: The National Environment Exchange Network Connects Emissions Data," M. West

For the past four years, the National Environmental Exchange Network has offered one means of reporting emissions inventory data. As the national attention has turned to climate change, states have taken the lead on collecting greenhouse gas emissions data, though USEPA is now poised to take action nationally. An international consortium of state, regional, and provincial governments in the U.S., Canada, and Mexico have joined The Climate Registry (TCR) to collect greenhouse gas emissions data. The landscape for this new program is mixed. Several states are enacting mandatory reporting, while industry is asking for voluntary reporting in other areas to establish an emissions baseline. This rapidly evolving program area could easily lead to a patchwork of disparate and disconnected data efforts. But thanks to the National Environmental Information Exchange Network, we have the systems already in place to establish commonality and sharing arrangements now, and to expect that they will be consistent with future USEPA actions. The Exchange Network will help TCR serve its diverse customer base in a common manner, reducing overall costs and improving integration between data sources. The National Emissions Inventory and its successor will be closely tied to this effort.

1:55 "The Air Emissions Inventory (AEI) Project: An Update on a Universal Schema," S. Rasmussen, D. Burling, P. Garvey and S. Dombrowski

The Air Force's Electronic Emissions Management System (APIMS) is nearing completion of a fully automated and streamlined submission mechanism for its air quality reports. The Air Force, the States of Nebraska, North Carolina, Texas, Maine, Washington, and the EPA are currently working together on the development and use of a single file format, or schema, which could save the Air Force millions of dollars. The schema has been constructed in such a way as to provide all the required data elements for reporting to the EPA. These elements have been designed to use naming conventions expected by the EPA as well as in some cases using shared schema elements developed for the EPA's Emission Inventory System. This should provide ultimate compatibility between state and federal agencies. The schema has also been constructed to allow for the flexibility to transmit corrections to previous submissions. This paper will provide an update on the status of the project. It will describe the steps completed thus far in the project, explain the current tasks underway, and give a description of the steps remaining to complete the project. Finally, the paper will attempt to provide rough estimates as to completion dates for these steps.

2:20 "Development of a Commodity-based Fire Emissions Tracking System," M. Mavko and D. Randall

Due to Regional Haze Rule requirements and Smoke Management Programs' (SMP) reliance on near-real time fire emissions data, many states and Tribes in the Western U.S. need a fire activity and emissions tracking system. This paper introduces the Western Regional Air Partnership's (WRAP) Fire Emissions Tracking System (FETS), a web-based fire data management system developed to fulfill the needs of states, Tribes, and the WRAP as they utilize fire emissions data for a variety of air quality planning purposes. The FETS provides routine fire data acquisition (planned and unplanned fire events), stable data storage, and real-time regional coordination among SMPs. It was developed using commodity products, existing hosting services and hardware, and open source development tools. The fire science and other technical services of the FETS were developed modularly using Python and GRASS GIS, taking advantage of available tools such as CONSUME 3 for emissions calculations and the online WIMS dataset for fuel moisture. Users access and use the FETS via a standard internet connection. This paper describes the features of the FETS, including: multiple methods of data acquisition (designed to minimize redundant efforts by SMP personnel); on-screen Quality Control (QC) tools; a mapping tool with pan, zoom, and summary statistics functions; reporting tools including custom queries to download summaries of acres burned, emissions, Natural vs. Anthropogenic burns, and the application of emission reduction techniques (ERTs). The FETS serves the immediate needs of the public and SMP personnel to review data for currently burning and planned fires. Data Analysts from agencies may retrieve QC'd fire data for use in air quality models or other types of analyses. Air Quality Planners can retrieve data to assemble emissions inventories for State Implementation Plans (SIP) and to prepare specific demonstrations of the effectiveness of the application of ERTs and states' progress toward meeting Annual Emissions Goals for fire. Lastly, this paper will describe further development of the FETS planned for 2008 and beyond.

2:45 Break

3:15 "Recent Applications of the Control Strategy Tool (CoST) within the Emissions Modeling Framework," A. Eyth, D. D. Vecchio, D. Yang, D. Misenheimer, D. Weatherhead, L. Sorrels and S. Ehrhardt

The Environmental Protection Agency (EPA) is developing the Control Strategy Tool (CoST) to allow users to generate emission inventories with additional controls applied on top of a future-year base inventory. CoST tracks information about control measures, such as their costs and the types of emissions sources to which they apply. The purpose of CoST is to develop control strategies that match control measures to emission sources using algorithms such as "maximum emissions reduction" and "apply measures in series". The result of a control strategy contains information that specifies the estimated cost and emissions reduction achieved for each control measure-source combination. Control strategy results can be exported to CSV files or viewed in a graphical table that supports sorting, filtering, and plotting. The results can also be merged with the original inventory to create controlled emissions inventories that can be exported to files that can be input to SMOKE. Cost is currently implemented as components within the Emissions Modeling Framework (EMF), which is currently being used by EPA to solve many of the long-standing complexities of emissions modeling. By providing this new tool integrated within the EMF, it facilitates a level of collaboration between control strategy development and emission inventory modeling that was not previously possible. CoST Support multi-pollutant analyses, data transparency, and provides a wide array of options when developing control strategies. Recent applications of CoST include detailed onroad and nonroad mobile source strategies and a pilot study for greenhouse gases. The results of these applications will be discussed.

3:40 "An Electronic Data Entry System for Point Sources," S. Ehrhardt

In 1999, in response to requests from industries, St. Louis City and St. Louis County cooperated to develop a software program in MS Access to enable our point sources to submit their emission inventory data electronically. Originally the program was developed in MS Access 97. It is still in use, now in MS Access 2000 through 2007.The overriding objective of the program is to make the annual emission inventory submittal as painless as possible for the industry personnel, and still collects all the necessary data. In developing the program, we addressed industry concerns about confidentiality, integrity of the data as submitted, and user friendliness. Since the St. Louis City and St. Louis County data is submitted to the Missouri Air Program, we also had to develop a system to transfer the data into a format that is compatible with their system. By using an MS Access database, we are able to extract data as we need it for our local agency use, including permitting, enforcement and fees. It also lends itself to easy quality assurance.

4:05 “Using Exchange Network and CDX Services: Key Steps for Exchanging Emissions Inventory Data,” R. Chaudet, C. Freeman and C. Clark

Approximately eighteen agencies are currently submitting emissions inventory data to EPA’s Emissions Inventory Analysis Group (EIAG) for the National Emissions Inventory (NEI) using the Exchange Network (EN). All fifty states have full EN nodes in place and are exchanging data for at least one environmental program. The remaining, State, Local and Tribal (SLT) agencies can use the services provided by the EN and EPA’s Central Data Exchange (CDX) to submit and exchange emissions inventory data. Some of these agencies are receiving EN grants to include the NEI dataflow for network exchanges through their existing nodes. Use of the EN and Extensible Markup Language (XML) is considered the main data transfer process and format for submissions to the new Emissions Inventory System (EISys). In addition, future benefits may include the use of a universal XML schema and the EN for exchanges between industry and states. This presentation focuses on: (1) available EN and CDX services, (2) how those services are used in exchanging and publishing emissions data between SLT agencies and EPA, as well as among SLTs, (3) steps for state air programs to use these services through their existing state nodes, (4) steps for Local and Tribal agencies not working with a state to use a Node Client for exchanges, and (5) communicating between program and IT staff. The presentation will include examples of how the EN is being used to share data among states for multimedia as well as for emissions data exchanges.

4:30 “Emission Reduction Analysis Tool for Heavy Duty Diesel Engines,” J. Wang and A. Booth

The reduction of diesel engine emissions is a high priority to regulators and the public due to the documented health impacts. Fleet managers and government regulators are faced with many emission reduction options, including fuel improvements, engine replacements, and the installation of retrofit controls. To assist in the decision making process, the “FLEET” Emission Calculator tool was developed for fleet managers and regulatory agencies to analyze and compare commercial emission reduction technologies for on-road and non-road heavy duty diesel engines. The tool estimates baseline emissions from a fleet, or group of sub-fleets, and determines the reduction in emissions that could likely be achieved using a number of retrofit options. The on-road emission estimates of criteria air contaminants are based on measured emissions from diesel engine families compiled from the EPA Engine Certification program. Non-road estimates are based on the methodology employed by the EPA NONROAD2005 model which incorporates: steady-state emission factors, transient adjustment factors, and deterioration factors. Lifetime cost effectiveness (present value / lifetime tonnes reduced) of each emission reduction option is calculated using user-specified economic data or default values obtained from research of typical values for diesel engines operating in Canada. Benefits of the “FLEET” Emissions Calculator Tool include: an objective and focused analysis as the information needed to make decisions is in one location (rather than having to get references from the web, manufactures, estimation of life span, cost benefit analysis, etc.); consistency for all of the fleet operators as they will be accessing the same information; and, the tool can be easily customized for a particular fleet as it allows for a range of emission controls and fuel options. The benefits from the use of the tool in assessing emission reduction strategies will be illustrated using practical fleet examples.

Session 9. Emission Inventory Data Analysis

Chairs: Linda Chappell, US EPA
Marc DesLauriers, Envr Canada

3:15 “Reactive and Non-Reactive Species of Nitrogen in Atmospheric Emission Inventories – A Review” S. Reis, M. Zhang, G. Lijie and M. Sutton

Nitrogen in different forms is naturally available in abundance in the atmosphere. Excess nitrogen, however, has gradually become the one cause for the most pressing environmental problems we currently face in various regions of the world. Interactions between the drivers, namely emissions of ammonia, nitrogen oxides and nitrous oxide and pressures such as air pollution, acidification and eutrophication of soils and freshwater ecosystems, ecosystem damages and biodiversity impacts, leaching of nitrates into groundwater and global warming are very complex. Furthermore, trade-offs between effects and the control of a variety of emission sources lead to a need to balance the management of nitrogen at all stages of the nitrogen cycle. This paper investigates, how emissions of different nitrogen species, oxidize and reduced, reactive and non-reactive, are currently treated in emission inventories in Europe, the United States of America, and The People’s Republic of China. Focusing on anthropogenic sources, the aim of the work presented here is to review the state of the art of quantifying the emissions of NH3, NOx and N2O, their temporal and spatial patterns and to assess, if current inventories provide a solid data basis for atmospheric dispersion models. This is of particular importance to quantify emission inventories which are robust and of sufficient accuracy to serve as input data for verification and validation purposes, e.g. in trying to quantify nitrogen budgets, respectively to close gaps between measured and modeled concentrations, as it is for instance the case with the "ammonia gap" observed in several European countries.

3:40 "Regional Haze Technical Analysis Using the Colorado Emissions Trace," C. Taipale

Regional Haze Technical Analysis using the Colorado Emissions Trace The Colorado emissions trace is a tool that graphically combines the information from the PM Source Apportionment Technology (PSAT), Weighted Emissions Potential (WEP), and emissions inventory with the statewide stationary source and area source pivot tables. The emissions trace is specific to each IMPROVE monitor for each pollutant (e.g. sulfate, nitrate, organic carbon, elemental carbon, fine soil and coarse mass). The emissions trace focuses on the worst days to allow for easy identification of sources and the percentage contribution of each category of emissions. In Figure 1, an example emissions trace is provided for 2018 sulfate emissions at Rocky Mountain National Park. The purple rows denote the source of the data that is identified in the gray bars which identify the specific information displayed in each column. For example "2018 SO4 PSAT is shorthand for the sulfate PM Source Apportionment Technology modeling for 2018 at Rocky Mountain National Park. All the information used in the emissions trace is available to the public and can be found on the WRAP TSS website. Figure 1: 2018 Sulfate Emissions Trace for Rocky Mountain National ParkAs depicted above, there are three types of sulfate that are distinguished by in three colors. The light green colored bar denotes natural sources of secondary particulates, which are fairly common for organic carbon. The light yellow bars denote natural and anthropogenic sources of primary particulates, which are common for elemental carbon, soil and coarse mass. The light blue bars denote anthropogenic sources of secondary particulates, which are common for sulfate and nitrate. The attribution of source regions is depicted in the blue trace. Under the Colorado trace, the contributions from point, area and mobile sources are identified based on the PSAT modeling. The lower WEP trace (denoted with a dashed line) is provided for comparative purposes against the PSAT information above. Associated with each source category, the emission inventory information is provided on the blue trace. Following after the emissions inventory, are the source categories based on the WRAP pivot tables for stationary sources and area sources. The map on the left side of Figure 1 is from the WEP analysis for sulfate at ROMO for 2018.The emissions trace allows for the consolidation of a vast array of WRAP data products into a compact graphic that allows for quick review of potential contributors to visibility impairment.

4:05 "The use of Bio-mass: synergies and trade-offs between Climate Change and air pollution in Italy," T. Pignatelli, I. D'Elia, G. Vialetto , M. Bencardino, and M. Contaldi

Bio-masses have recently gained attention, at international level, as a relevant option to combat Climate Change. The effects of extensive use of bio-masses for energy production, in replacement of fossil fuel, are widely debated internationally, due to the high intrinsic potential to reduce the greenhouse gases. Therefore, the energy experts have developed alternative energy scenarios based upon increased shares of bio-mass fuel. Nevertheless, in the frame of the UN-ECE Convention on Long Range Transboundary Air Pollution, some warnings have raised about the trade-off effects associated with the bio-mass, in terms of increased emissions of other pollutants, like the particulate matter. This paper is aimed at analyzing the potential effects of such "bio-mass" alternative energy scenario, in terms of CO_2 reduction and co-lateral effects on other air pollutants, in comparison with a reference scenario, highlighting advantages and disadvantages. The study has been carried out by the Integrated Assessment Model GAINS-Italy, a multi-pollutant multi-effect model developed by ENEA in cooperation with the International Institute for Applied Systems Analysis (IIASA), in Laxenburg, Austria. The energy scenarios have been developed by the Markal-Italy Model.

4:30 "Refining and Analyzing Emissions Data for Use in Regional Haze Planning," P. Fields and L. Gribovicz

The Western Regional Air Partnership (WRAP) is assessing impacts and evaluating control strategies pertaining to regional haze within its geographic domain: States of Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming, and the Native American reservations located within these states. To assist the WRAP with this assessment and to provide base year (2002) and projection year (2018) inputs into the visibility models used by the WRAP's Regional Modeling Center, the WRAP and its contractors developed initial inventories in 2005, and refined them over the past 2 years to make corrections and updates and provide the most accurate inventories possible. This paper provides a background on the point and area source emissions inventories developed for the WRAP region. We explain the evolution of the inventories in recent years in order to make improvements, add new or more current data, and address special analytical needs of the WRAP's visibility planning process including the following: emission limits for sulfur dioxides (SOx) and nitrogen oxides (NOx) from Best Available Retrofit Technology (BART) implementation; evaluating reasonable progress toward regional haze reduction goals; providing a baseline and emissions cap for the SO2Annex (i.e., an alternative SO2 Milestone and Backstop Emissions Trading Program; and providing emissions in formats needed for modeling and dissemination to the Wrap's state, local and tribal members.

Thursday - June 5, 2008

Session 10. Emission Inventory Validation and Quality Assurance

Chairs: Bob McConnell, US EPA
Sally Dombrowski, US EPA

8:30 "Evaluation of NOx Emissions in the Western US Using WRF-Chem Model Simulations and Satellite Observations," W. R. Barnard, S-W Kim, A. Heckle, G. Frost, A. Richter, J. Gleason, J. Burrows, S. McKeen, E-Y Hsie and M. Trainer

In the western U.S., there are many isolated sources of NOx emissions such as power plants, cities, and highways. Thus, errors in bottom-up NOx emissions from various sectors could be evaluated separately with atmospheric chemistry models and satellites in this part of the U.S. We carried out simulations with the Weather Research and Forecasting-Chemistry model (WRF-Chem) for the western US domain during the summer of 2005. The sensitivities of simulated NO2 columns to chemical mechanism and scalar-advection scheme are examined. These factors explain 10-20 % variability of model NO2 columns, exhibiting larger variability over more polluted regions. Model NO2 columns are compared with SCIAMACHY and OMI satellite observations. For SCIAMACHY satellite data, the effects of a priori NO2 profile and aerosol loadings on the retrieved NO2 columns are investigated. These factors explain 10-30% variability of satellite NO2 columns, indicating significant impact of aerosols on the retrieval over the big western cities such as Los Angeles, Fresno, Sacramento, and San Francisco. To check the accuracy of satellite retrieval, the two satellite data are compared with the model NO2 columns over Four Corners and San Juan power plants. Because emissions from these power plants are well monitored, uncertainties in model emissions from these power plants are much less than those from cities and highways. Thus, model NO2 columns over this region can be regarded as a surrogate for in-situ measurements. Overall, both SCIAMACHY and OMI NO2 columns over these power plants agree well with model NO2 columns with discrepancies between the two being within the variability of model or satellite. In contrast to this power plant region, model NO2 columns over big cities along the west coast are approximately twice as large as satellite NO2 columns from SCIAMACHY and OMI, implying overestimations of the bottom-up emissions over these cities. Possible causes of these discrepancies will be suggested.

8:55 "Top-down Evaluation of Point Source NOx, SO2 and CO Emissions and Comparison to Inventories", G. J. Frost, T. B. Ryerson, M. Trainer, J. S. Holloway, J. W. Peischl and F. C. Fehsendeld

Point source electric utility power plants are substantial sources of directly emitted NOx, SO2, and CO2 to the atmosphere. We use airborne field data to assess 1. the accuracy of the hourly continuous emissions monitoring systems (CEMS) emission ratios of NOx/CO2, SO2/CO2, and CO/CO2 for dozens of plants throughout the U.S., 2. track emissions changes over time, and 3. quantify any changes in atmospheric concentrations of these priority pollutants due to deliberate emissions reductions at power plants. We conclude from these analyses that emissions ratios tabulated in bottom-up national inventories based on CEMS data are in excellent agreement with emissions ratios derived using top-down estimates from ambient measurements. However, the frequency of updates to the national gridded inventories using CEMS data is not sufficient to track emissions changes in a timely manner, and thus hampers modeling efforts. Our power plant data analysis provides confidence in our use of airborne observations to extract emission ratios from other types of sources whose emissions are not measured on a continuous basis, such as large industrial point sources and urban areas.

9:20 "The Effect of Input Assumptions on the results of IPM Modeling Runs Used to Predict Future Pollutant Emissions," J. McDill

Regional haze and fine particle pollution in the eastern U.S. are currently dominated by sulfate pollution, and the principle sources of SO2 emissions contributing to sulfate are the large coal fired installations in and near the region, including electric generating units (EGUs). The U.S. Clean Air Interstate Rule (CAIR) introduced a cap and trade approach to controlling air emissions in the eastern U.S. Under this rule EGU emissions are constrained by the price of pollutant allowances rather than firm permit limitations. This introduces new uncertainty into the task of forecasting future EGU emissions. IPM® is a least cost model used extensively by both regulators and the regulated community in the United States to predict Electrical Generating Unit operating schedules and the resulting air emissions resulting from that operation. These predictions can vary widely depending on the assumptions used in a particular modeling study. Important assumptions include the price and availability of both fuel and control technology, and the controls installed for other reasons outside the emissions trading scheme. This paper will compare modeling studies that use different sets of plausible inputs. State by state and regional variation will be discussed. The comparison will provide an indication of the range of outcomes that might be expected by 2018, thus assisting policy makers in evaluating the likelihood of predicted fine particle pollution and visibility outcomes.

9:45 Break

10:15 "Determination of Biogenic Emissions from Aircraft Measurements During Four Campaigns and Comparison with Biogenic Emission Inventories," C. Warneke, S. McKeen, J. A. de Gouw, J. Brioude, H. Stark, M. K. Trainer, F. C. Fehsenfeld, C. Wiedinmyer, A. B. Guenther and L. Del Negro

Isoprene and monoterpenes were measured with a PTR-MS instrument onboard the NOAA WP-3 aircraft during the TEXAQS2006, TEXAQS2000, ICARTT2004 and SOS1999 campaigns. Isoprene emission fluxes are estimated using a mixed boundary layer approach, which takes the isoprene lifetime into account. The results are directly compared to the EPA BEIS-3 inventory (EPA Biogenic Emissions Inventory System). In addition, the EPA BEIS-3 data were incorporated in a Lagrangian particle dispersion model (FLEXPART) and the mixing ratios calculated from the model are compared to the measurements. This model calculation takes transport, but not chemistry into account and can also be used to determine the transport of isoprene and its oxidation products over several hours. Both methods indicate that EPA BEIS-3 quantitatively agrees well with the emission fluxes estimated from the aircraft measurements. Some differences are dependent on the day and the location but for all flights an agreement to better than a factor of two was found. Clear discrepancies were observed for specific locations, such as some forested areas north-west of Houston, Texas, or at the border between Canada and the US in the New England area. Other isoprene emission inventories were also compared to the emission fluxes estimated from the in-situ measurements. An inventory compiled by Wiedinmyer et al. for the Texas area using different land cover data clearly improved the comparison. The emission fluxes estimated from the measurements are also compared to Model of Emissions of Gases and Aerosols from Nature (MEGAN).

10:40 "Using Google Earth to Display Emissions Data", J. Drukenbrod

If you have ever spent large amounts of time decrypting dense, hard-to-read tables of data, then visualization tools are more appealing than ever. As the demand to visualize data increases, the market for these tools will continue to expand. Recognizing potential applications for studying air data, EPA's Emissions Inventory and Analysis Group recently built a visualization tool which exploits a previously unexploited mutual relationship between one of the world's most powerful statistical packages and one of the fastest growing geo-spatial display packages. The results of harnessing this relationship is a powerful yet user-friendly application providing anyone with an internet connection and a copy of Google Earth to explore the facilities and their emissions throughout the U.S. The purpose of displaying data in this fashion is to provide a range of users a better understanding of the emissions inventory on a spatial and temporal level. The first public product provided users the ability to create these visualization files based on selected parameters. This paper will focus on these files and describe the various uses for displaying and understanding emissions. This paper will also discuss new features which are currently being explored to provide more options for interpreting and understanding data through this method.

11:05 "The Netherlands PRTR-System and Quality Control by the Public," C. W. M. van der Maas

Last summer the Netherlands Environmental Assessment Agency launched www.prtr.nl as an implementation of the Aarhus requirement to present emission data to the public. Almost a hundred million emissions are shown, complemented by documentation about how these emissions are calculated. There are three ways to explore this large amount of data: (1) select emission-sources and present the trend in a graphic, (2) create your own map or (3) download a selection into your own database system. Unique is the mix between point sources and diffuse sources. For the first time the public can see the contribution of local traffic in their community in relation to the emissions from the refinery next door. In the last conference we presented the general scope of this website and the way we allocate emissions from diffuse sources (like agriculture and transport) and the emissions from small and medium enterprises (SME's) using activity data and GIS. This year we stress on the role of the public to check and correct the presented data and the lessons we learned in communicating a complex message to the general public.

11:30 "Using Air Quality Modeling to Improve Air Emission Inventories," V. Gois

Emission inventories (EI) are nowadays a key component of environmental management, particularly in the process of verification of compliance of national ceilings, in atmospheric modeling, as well as for establishing background scenarios for the development and monitoring of plans and measures. Being the foundation of decision-making on air quality management, the development of emission inventories must be made accordingly to highly reliable standards. Therefore, EIs should be validated at the most appropriate level, which means that the evaluation procedures should verify their performance as air quality prediction tools when in conjunction with air quality models. In Portugal, the main goal of the National Inventory (INERPA) is to verify that Portugal is complying with its international commitments at national level (UNFCCC, CLRTAP, UE-NEC Directive and Stockholm Convention). However, efforts have been made since 2005 to couple estimates of national totals with an inventory model with a high detail level of spatial allocation of emissions, and with suitable temporal disaggregation of emissions per sector. In order to evaluate the Portuguese INERPA and to conclude about the best resolution to be used, air quality models were combined with several emission inventories resolution schemes available for Portugal (INERPA, EMEP and LOTOS). Evaluations were performed with the CHIMERE model, forced by the MM5 meteorological fields, over the Portuguese domain. Simulation tests were made to different national totals of the emission inventories. Their distinct spatial disaggregations, and also the temporal profiles, were used for time disaggregation. Results of this evaluation exercise have shown discrepancies between emission inventories most probably due to differences in spatial disaggregation. Sensitivity tests to various road traffic temporal profiles show particular influence on the air quality results, confirming that the use of average European profiles may not be appropriate at national nor regional level. The results of this analysis lead to the improvement of emission inventories and the quality of results from air quality models.

Session 11. Mobile Sources

Chairs: Laurel Driver, US EPA
Joe Pedelty, US EPA

8:30 "Link Based vs NEI Onroad Emissions Impact on Air Quality Model Predictions," M. Strum, K. Wessom, S. Phillips, A. Pollack, S. Sheppard, M. Jimenez, A. Beidler, M. Wilson, D. Ensley, R. Cook, H. Michaels and D. Brzezinski

The U.S. EPA has conducted air quality modeling for a multi-pollutant pilot project around the Detroit area. One aspect of the study is the investigation of spatial gradients in concentrations resulting from a more detailed characterization of local sources of emissions than is generally done for regional scale air quality modeling. In particular, we compared the air quality model predictions for multiple pollutants, i.e., criteria pollutants and air toxics using two different emission scenarios for the on-road mobile emissions: (1) link-based on-road mobile emissions, and (2) National Emission Inventory on-road emissions. We generated the link based emissions using the CONCEPT motor vehicle emissions model, recently updated for mobile source air toxics. The National Emissions Inventory on-road mobile sector used the NMIM model, which relies on county-level data. EPA compared the modeling results from these two emission scenarios using the CMAQ model at 12 km resolution, and a hybrid modeling approach in which AERMOD model simulations are used in conjunction with CMAQ to estimate the subgrid cell variability. We will show the differences in emissions for these two scenarios and the impact on the model predictions. We will also compare the predictions to the monitored data.

8:55 "EmiLink: A Quantitative Mobile Source Air Toxics (MSATs) Analysis Tool," C. Klaus, M. Venugopal, K. Yu and S-K Park

As part of National Environmental Policy Act (NEPA) documentation the Federal Highway Administration (FHWA) requires a project level quantitative Mobile Source Air Toxics (MSATs) analysis to identify air quality effect of major transportation projects. As per FHWA interim guidance, an MSAT analysis should be conducted for every project that has an annual average daily (AADT) traffic volume greater than or equal to 140,000. Since the MSAT analysis procedure is consistent for all new or improved roadway projects, the North Central Texas Council of Governments (NCTCOG) has automated the process using EmiLink, a tool that estimates emissions for every roadway network link and for every hour of the day in the Dallas-Fort Worth region. EmiLink is a user-friendly graphic user interface (GUI) module created using Visual Basic programming language and GISDK (TransCAD's scripting language) where the user provides the path for the input files. The inputs include EPA's MOBILE6.2 emission factors and Vehicle Mile Travel-mix. Since EmiLink runs on the travel demand model platform (TransCAD), the program can retrieve the vehicle volume, Vehicle Miles of Travel (VMT) and speed for all roadway links in the Dallas-Fort Worth Regional Travel Model (DFWRTM) network for respective model years. EmiLink has been successfully applied to 20 projects undergoing NEPA process in the Dallas-Fort Worth area, and has not only reduced the time required to complete an MSAT analysis but also provides procedural and data assumption consistency. The outputs include, a tab delimited summary of emissions (including Diesel Particulate Matter) and volume for each hour of the day, photochemical modeling formatted hourly link-level inputs, daily and annual link-level emissions, volume and VMT summaries that can be easily modified to identify links that have +/- 5 percent change in volume when comparing between build and no-build network, and TransCAD files that can be easily converted to ArcMAP format (shapefile, geodata, etc.) for GIS analysis. EmiLink can be used to estimate other mobile source emissions.

9:20 "Observational Evaluation of Mobile Source Emissions," G. Frost, S. McKeen, M. Trainer, K. Aikin, J. Peischl, T. Ryerson, J. Holloway, G. Petron, P. Tans and R. Harley

Ambient ratios of NOx, CO, and CO2 sampled by aircraft in Houston and Dallas during the 2000 and 2006 Texas Air Quality Study (TexAQS) are compared with each other and with observations at a Houston highway tunnel. From these measurements we estimate 2000 and 2006 emissions for Houston and Dallas mobile sources. The observations demonstrate time-of-day variations in the relative contributions from gasoline and diesel combustion which are consistent with known traffic patterns. We incorporate CO2 emissions derived from the Federal Highway Administration's motor vehicle fuel use statistics into the EPA's National Emission Inventory (NEI), resulting in an emission data set for NOx, CO, and CO2 with 4-km spatial and hourly temporal resolution. Comparison of the emission ratios derived from the TexAQS observations with this inventory allows a direct evaluation of the NEI mobile source NOx and CO emissions.

9:45 Break

10:15 "Making the Transition to MOVES," G. Dolce

EPA's MOVES is an emissions modeling system that will eventually replace MOBILE6 and NONROAD as EPA's tool for estimating air pollution emissions from mobile sources. This presentation will describe the intended uses of MOVES, the status regarding the current availability of a Beta version of MOVES and process for public review, and future milestones for publishing a final version of the modeling system.

10:40 "Intermodal Yard Activity and Emissions Evaluations," C. Lindhjem

The containerization of freight in the movement of goods has been a revolution in terms time, space, and cost efficient freight movement. This phenomenon has lead to the growth of intermodal yard operations at ports, rail yards, and increased truck movements gaining the attention of local planners. Intermodal yards and truck terminals may have a significant impact on local communities prompting requests for analysis of these facilities' activities. This paper outlines the operations at intermodal yards in terms of activity at variety of marine and rail intermodal yards based on work performed at ports and rail yards in California. The paper discusses the input activity parameters (equipment population, annual hours of operation, and engine load) for marine vessels, rail locomotives, cargo handling equipment and other nonroad equipment, and truck movements associated with moving containers through the terminals and yards based on work conducted in California. The results of this work include scaling operations to freight movements and discuss the operational design options likely to be found at any terminal. The design of the yard and choice of technology used at these yards both affect the emissions from the yard's activity, and this paper describes the effect of several options for designing intermodal yards.

11:05 "Improving the Spatial Allocation of Construction Equipment Emissions," S. Smeltzer

Construction equipment can be a major source of ozone pre-cursor emissions. Construction equipment emissions represent 6.9 tons of NOx per day in San Antonio or about 4% of the city's total NOx emissions. The location of construction projects can have a significant impact on readings of pollutants at down-wind monitoring sites; thus, it is important to allocate construction equipment emissions accurately. Default spatial allocation of construction equipment emission is often inaccurate because construction occurs at the outer edges of urban areas were new housing, commercial development, and roads are being built. Large mining sites can also account for a significant portion of construction equipment emissions. To allocate construction equipment emissions more accurately in photochemical and other dispersion models, construction equipment within the San Antonio area was broken down into sectors based on type and purpose of equipment used. Local department of transportation, utility companies, government agencies, and private companies were contacted to collect data on amounts and locations of construction projects. Also, residential building permits, commercial building permits, and demolition permits were collected to geo-coded construction emissions. GIS software was then used to allocate emissions to the grid systems used by photochemical models. This can improve the accuracy of predicting ozone formation and the effectiveness of control strategies. When construction equipment was geo-coded using this method, increased emissions were evident on the west side of San Antonio where there is new housing, commercial buildings, and services under construction. In addition, there was an increase in emissions along the northern section of the city and at mining/quarry sites. Emissions decreased in downtown San Antonio because there are fewer new construction projects in this area of the city.

11:30 "Use of National Mobile Inventory Model (NMIM) for Photochemical Modeling Applications in Texas," C. Kite and J. MacKay

The free National Mobile Inventory Model (NMIM) software tool (http://www.epa.gov/otaq/nmim.htm) released by EPA in 2006 enables the user to quickly obtain high-quality emission estimates by County for both on-road and non-road categories for any calendar year from 1999 to 2050. Texas Commission on Environmental Quality (TCEQ) staff use NMIM to obtain both on-road and non-road emissions for all U.S. States that are outside of Texas, but within its photochemical modeling domain. This domain covers most of the Eastern U.S., stretching from West Texas to the Atlantic Ocean and the Gulf of Mexico to Southern Canada. Significant time, effort, and cost are expended by TCEQ to develop the on-road and non-road emissions for counties within Texas, but this same level of cost and effort is not warranted for States far away from the metropolitan area under consideration for ozone modeling. Nonetheless, high-quality inventories that can be obtained with minimal time and effort for multiple calendar years are needed for these non-Texas States. NMIM can be freely downloaded and installed with minimal effort. A graphical user interface (GUI) is employed that enables quick setup for any combination of counties, calendar years, pollutants, vehicles/equipment, etc. to be modeled. NMIM runs that involve several hundred or thousand counties may take several hours to run on a modern personal computer, but such runs can occur overnight or on weekends to minimize computer down time. Estimating on-road emissions for any year beyond 2002 requires the user to provide their own vehicle miles traveled (VMT) estimates by county and calendar year. To estimate VMT growth out to 2050, TCEQ staff obtained historical VMT by State for 1980-2006 available from the U.S. Federal Highway Administration (FHWA). This data set categorizes VMT by State into the twelve Highway Performance Monitoring System (HPMS) "urban" and "rural" roadway types employed by NMIM. TCEQ staff has used Excel spreadsheet software to establish linear VMT growth trends for 2007-2050 based on the 1980-2006 historical FHWA data. The 2002 VMT data within NMIM is exported as a text file and then adjusted using custom SAS code. The revised VMT data set for a specific future year (e.g., 2007 or 2050) is imported back into NMIM based on recommendations from Exercise 13 on Pages 60-66 of EPA's 5-15-2006 "NMIM Training" presentation (http://www.epa.gov/ttn/chief/conference/ei15/training/nmimcourse2006.pdf). The final NMIM output data are formatted using SAS code for input into Version 3 of the Emissions Preprocessor System (EPS3).

Session 12. PM: Agriculture & Ammonia; Managed Burning & Wildfires

Chairs: Tom Pace, US EPA
Tom Moore, WRAP

8:30 "A Temporal Inventory of Ammonia Emission from Agriculture Sources in Canada," S. Bittman, S. C. Sheppard, S. M. Beaulieu and J. Ayres

Emission of ammonia into the atmosphere is well known to be detrimental to the environment due to deposition in natural ecosystems and direct toxicity to sensitive plants. There is new concern that ammonia from agricultural sources contributes to the formation of secondary particulates, which pose a threat to human health. A new inventory of emissions from agricultural sources has been developed for Canada. This inventory accounts for annual emissions from the principal livestock classes: beef, dairy, pigs and poultry (322 ktonnes) and from fertilizer application (110 ktonnes) which together account for 85% of all emission in Canada. The inventory is based on two new national farm activity surveys, expert opinion and published emission factors. Monthly emissions values were calculated for each of 12 ecoregions. The number of available days for manure application was determined, based on soil traffic ability, so that the emission intensity for application and non-application days could be calculated. Results show generally low emission in winter months and a sharp peak in May due to fertilizer and manure application. Mid-summer emissions were generally lower depending on sector, and emissions in fall relative to spring varied with ecoregion. In the livestock sector, emissions were generally greater from land spreading of manure than from housing and storage. Emission intensity was greatest in areas of high livestock densities, such as southern ON, St. Lawrence lowlands of QC, southwestern AB and south-coastal BC. The emission data are being used as input for an atmospheric model that predicts chemical transformation, PM formation and long range transport of gaseous ammonia and particulate ammonium.

8:55 "Comparing Area Burned Estimates for the Continental United States in Support of the National Emissions Inventory", A. Soja, J. Al-Saadi, G. Pouliot, L. Giglio, C. Wiedemyer, S. Raffuse, X. Zhang, S. Kondragunta, T. Pierce, B. Pierce, T. Pace, C. Kittaka and J. Szykman

Fire emissions are calculated by estimating the amount of biomass fuel that burns in an estimated space over time. There is error associated with each component of this estimate, which includes the total amount of fuel, the amount that is available (dry enough) to burn, the percentage of carbon content, species-specific emissions ratios and the amount of area burned. A primary component to estimating fire emissions is area burned, because on a large-scale, area burned estimates can differ by an order of magnitude. In this work, we intend to present a detailed spatial and temporal analysis of one component of fire emissions, area burned, while holding the other components of this equation steady. In this way, we endeavor to tease apart the value of various methodologies and suggest potential areas for algorithm improvement. First, area burned will be inter-compared using several unique methodologies that differ by collection methodology (helicopter, satellite) and in spatial (polygon, 16 km2, 1km2) and temporal (30 minute, daily, 4 x daily, post-fire scar) domains. We intend to highlight strengths and weaknesses of the various methodologies in an effort to move more closely towards truth. For instance, ground-based data, which is often considered to be "truth", often includes unburned islands that can lead to a 25% overestimate in these scars. Additionally, the larger-resolution satellite data demonstrate an enhanced ability to sense small prescribed and agricultural fires due to an increased temporal signal. Medium-resolution imagery accurately define the shape of large fires as they move through time, however assumptions used to estimate the size of the area burned often lead to overestimates of area burned. With this information, each methodology can be improved or a hybrid methodology could evolve.

9:20 "Satellite Based Wildland Fire Emission Inventories", S. Urbanski, B. Nordgren, and W. Min Hao

Wildland fires emit large amounts of trace gases and aerosols and these emissions may have a significant influence on regional air quality. Fire activity and associated emissions vary significantly in space, time, and magnitude. Proper inclusion of fire emissions into air quality forecasting systems requires a rapid-response method to detect active fires and estimate emissions. Remote sensing from space borne platforms has proven to be a valuable fire detection method and the MODIS sensor on the Terra and Aqua satellites has been widely exploited for this purpose. At the Missoula Fire Sciences Laboratory (FSL), a MODIS direct broadcast (DB) receiving station is in place to demonstrate the potential for monitoring biomass burning and producing rapid-response emission inventories for assimilation into air quality forecasting systems. We present validation of a burn scar algorithm that combines active fire locations (MOD14) and burned area detections (Li et al., 2004) for a rapid-response measurement of fire burned areas. Using the FSL MODIS – DB burn scar algorithm, we have estimated daily burned area and emissions for wildland fires in the central and western U.S. for 2006 and 2007. Uncertainties in the emission inventories related to fuel loading and consumption are considered.

9:45 Break

10:15 "Impact of Fires on PM2.5 Air Quality," T. G. Pace, J. Drukenbrod, G. Pouliot and T. Pierce

Fire occurrence and air quality data collected in 2002 by IMPROVE, STN and PM2.5 networks are analyzed to identify days with measurements both upwind and downwind of fires. These data pairs are analyzed to determine the magnitude of fire impacts as a function of fire size, distance from the downwind monitor and deviation from direct downwind wind flow. Chemical species such as EC, OC and potassium will be characterized (where available) to help separate the fire impact from other potential sources affecting the upwind-downwind differential concentrations. Analysis of fire impacts using CMAQ will also be summarized and compared to the ambient data analyses.

10:40 "Development and Sensitivity Analyses of Wildland Fire Emission Inventories for 2002-2006," S. M. Raffuse, D. C. Sullivan, L. R. Chinkin, E. A. Gilliland, N. Larkin, R. Solomon and T. Pace

The BlueSky smoke modeling framework and SMARTFIRE were applied to facilitate the development of day-specific wildland fire emission inventories for the continental U.S. and Alaska for the period from late 2002 through 2006. The FCCS, CONSUME 3.0, and FEPS were used within the BlueSky framework to model vegetation distribution, fuel consumption, and emission rates, respectively. This paper summarizes findings, including activity data (acres burned), air pollutant emissions, spatial and temporal distributions, and comparisons with similar, but independently developed, emission inventories. The BlueSky framework and SMARTFIRE are shown to efficiently estimate highly resolved fire inventories that compare well to inventories prepared through conventional means. Uncertainty in the emission inventories is currently being explored by evaluating the sensitivity of the results to the inputs and models. Emission inventories are being prepared with satellite data only and with human-observed fires only for comparison to the inventories prepared using SMARTFIRE (i.e., satellite data reconciled with human observations). In addition, emission inventories are being prepared for a selected state using 30-m resolved vegetation data (LANDFIRE) for comparison with the inventories prepared using the FCCS(which is available at 1-km resolution). Lastly, emissions were estimated using EPM (rather than CONSUME 3.0 and FEPS). Findings from these comparisons will be presented.

11:05 "Development and Applications of Systems for Modeling Emissions and Smoke from Fires: The BlueSky Smoke Modeling Framework and SMARTFIRE," S. M. Raffuse, D. C. Sullivan, L. R. Chinkin, K. J. Craig, N. J. M. Wheeler, S. B. Reid, N. Larkin and R. Solomon

The BlueSky smoke modeling framework is a tool for modeling the cumulative impacts of multiple fires 1. Developed by the US Department of Agriculture-Forest Service (USFS), it facilitates coordinated operation of independently developed models to predict emissions from fires and resultant ground-level concentrations of fine particulate matter (PM2.5). This paper discusses recent improvements and applications of the BlueSky smoke modeling framework. For use in preparing inputs to the BlueSky framework (or other systems), a new system was developed to integrate and reconcile satellite-detected fires with human-recorded events and to estimate the size and extent of burned areas from satellite data. This system is called the Satellite Mapping Automatic Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE).SMARTFIRE harnesses the advantages of both data sets by reconciling satellite data with human-observed fires. Its algorithms apply geographic information to associate proximate fires, define large events or fire complexes, and maintain the associations over time as fire events progress across the landscape or even divide into multiple fire fronts. SMARTFIRE's algorithms have been fine-tuned and its results have been validated using real-world data from a variety of sources. The development, operation, and validation of SMARTFIRE, and the availability of SMARTFIRE results as a real-time web service are a major focus of this presentation. Additional topics of discussion include (a) recent re-engineering of the BlueSky framework to improve its modularity and adaptability, (b) development of new modules to accommodate various fuel consumption and fire emissions models (e.g., EPM and FEPS), and(c) demonstrations of the use of SMARTFIRE and the BlueSky framework to generate emission inventories in support of real-time operations for air quality predictions.

11:30 "Fire Emissions Inventories for Regional Haze Planning in the WRAP," D. M. Randall

Emissions from managed burning and wildfires in the Western U.S. contribute to regional haze. Technical challenges to include fires as emission sources in air quality planning analyses have been so thwarting that emissions from this important source have been left out of some analyses entirely. The Western Regional Air Partnership (WRAP) and its Fire Emissions Joint Forum (FEJF) have overcome enough of these challenges to include fire emissions in several rounds of regional air quality modeling (CMAQ) and source apportionment analyses. The WRAP expects that many states and Tribes will include fire emissions in their regional haze SIP analyses and will rely on Enhanced Smoke Management Programs (ESMP) as adopted SIP elements to improve visibility conditions in Class I areas. This portion of the panel discussion will describe the series of fire emission inventories that the FEJF has developed to fulfill specific functions in haze planning. An overview of common methodologies to develop these inventories and the key differences among the inventories will be presented. Solutions to overcoming technical challenges will be highlighted. The discussion will illustrate how the baseline (2000-2004) fire inventory and projection (2018) fire emission inventories address the unique requirements for haze planning in the west. Specific examples of how fire emissions are showing up in modeling results as part of natural background and as contributing to impacts on 20-percent best and 20-percent worst days will be shown. Uncertainty and limitations to the use of the fire inventories will also be discussed. Lastly, the WRAP's Fire Emissions Tracking System (FETS), an innovative inventory development tool that promotes data sharing and electronic exchange will be introduced.