14th Annual Emission Inventory Conference:

Transforming Emission Inventories
Meeting Future Challenges Today

Courses: April 11 - 12, 2005
Conference: April 12 - 14, 2005
Las Vegas, Nevada - Riviera Hotel

Sponsored by:

Emission Inventory Group
Emissions, Monitoring, and Analysis Division
Office of Air Quality Planning & Standards

Emission Inventory Improvement Program

Message from the General Conference Chair

The U.S. Environmental Protection Agency (U. S. EPA) invites you to the 14th Annual Emission Inventory Conference, "Transforming Emission Inventories - Meeting Future Challenges Today" to be held April 11 - 14, 2005 in Las Vegas, Nevada. The conference is being organized by EPA's Office of Air Quality Planning and Standards (OAQPS) and is supported once again by the Emission Inventory Improvement Program, a partnership between EPA and the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO).

The conference starts on Monday with training courses on several aspects of emission inventory preparation and use (see Training Schedule). On Tuesday morning, we will be conducting a workshop on developing the plan for the 2005 National Emission Inventory (NEI). This will be an opportunity for participants to share their ideas on the 2005 NEI schedule, changes to the NEI Input Format (NIF), and new automated quality assurance tools. The conference begins in earnest with a plenary session on Tuesday afternoon. Patrick Cummins, Co-Director of the Western Regional Air Partnership will be the Keynote speaker and will start off the session by sharing his experiences with regional approaches to understanding and solving air quality problems.

Next, the NARSTO Emission Inventory Assessment Team will present key findings from the report titled "Improving Emission Inventories for Effective Air Quality Management Across North America" which is scheduled for release at the Conference. The report identifies emission inventory programs needed for the 21st century, recognizes the capabilities and limitations of current programs, and recommends enhancements needed to move the programs forward. Participating in the presentation and a panel discussion will be co-chairs of the NARSTO Emission Inventory Assessment Team: J. David Mobley, US EPA; Marc Deslauriers, Environment Canada; Howard Feldman, American Petroleum Institute; Chris Frey, North Carolina State University; Leonora Rojas-Bracho, National Institute of Ecology of Mexico; Susan S.G. Wierman, Mid-Atlantic Regional Air Management Association; & Arthur S. Werner, MACTEC.

Two days of three concurrent technical sessions will follow on Wednesday and Thursday, covering a wide range of subjects related to state-of-the-art techniques for developing emission inventories. This is a great opportunity to keep abreast of developments in the world of emissions data so I hope you will attend and share your experiences with other emission inventory professionals from federal/state/local and international regulatory agencies, tribal governments, industry and academia.

Lula Melton
General Chair
Emission Inventory Group
Office of Air Quality Planning & Standards

Schedule at a Glance

Time	Session	Time	Session
Mon, April 11		Wed, April 13	
8:00 - 5:00	Courses (See Training Schedule)	4:00 - 5:30	Session 5 - Emission Inventory Validation/QA
Tue, April 12			Session 6 - Better/Faster Emission Inventory Development Methods
8:00 - 12:00	National Emission Inventory Restructuring Workshop		Session 7 - Fugitive Dust
12:00 - 1:30	Lunch (On Your Own)	Thur, Apr 14	
1:30 - 5:00	Plenary Session - Keynote	8:30 - 10:00	Session 8 - Mobile Sources
6:00 - 8:00	Poster Session and Exhibitor Reception		Session 9 - Point/Area Sources
Wed, April 13			Session 10 - Air Toxics
8:00 - 10:00	Session 1 - Agricultural and Ammonia Sources	10:00 - 10:30	Break
	Session 2 - Data Management	10:30 - 12:00	Session 8 - Mobile Sources
	Session 3 - Greenhouse Gas		Session 9 - Point/Area Sources
10:00 - 10:30	Break		Session 11 - Emission Inventory Preparation for Modeling
10:30 - 12:00	Session 1 - Agricultural and Ammonia Sources	12:00 - 1:30	Lunch (On Your Own)
	Session 2 - Data Management	1:30 - 3:00	Session 8 - Mobile Sources
	Session 4 - Tribal Emission Inventories		Session 9 - Point/Area Sources
12:00 - 1:30	Lunch (On Your Own)		Session 11 - Emission Inventory Preparation for Modeling
1:30 - 3:30	Session 5 - Emission Inventory Validation/QA	3:00 - 3:30	Break
	Session 6 - Better/Faster Emission Inventory Development Methods	3:30 - 5:30	Session 9 - Point/Area Sources
	Session 7 - Fugitive Dust		Session 11 - Emission Inventory Preparation for Modeling
3:30 - 4:00	Break		Session 12 - Managed Burning/Wildland Fires

Plenary Session

Key Findings and Recommendations from the NARSTO Assessment

The assessment, slated for release at this conference, identifies emission inventory programs needed for the 21st century, recognizes the capabilities and limitations of current programs, and recommends enhancements needed to move the programs forward. Findings and recommendations will be presented to improve the quality, timeliness, and affordability of emission inventories. Presenters: J. David Mobley, US EPA; Marc Deslauriers, Environment Canada; Howard Feldman, American Petroleum Institute; Chris Frey, North Carolina State University; Leonora Rojas-Bracho, National Institute of Ecology, Mexico; S. G. Wierman, Mid-Atlantic Regional Air Management Association: and Arthur S. Werner, MACTEC.

Patrick Cummins - Keynote

Patrick Cummins is the Air Quality Program Manager for the Western Governors' Association, where he also serves as Co-Director of the Western Regional Air Partnership. Over the last 18 years, Patrick has held environmental management positions at the federal, state, and local levels, and has worked in the natural gas industry as a corporate planner. Prior to joining the Western Governors' Association, he was Deputy Director of Denver's Regional Air Quality Council where he helped develop the air quality plans that brought the Denver area into attainment of all federal health standards. Patrick has a B.S. in Chemistry from Ft. Lewis College in Durango, Colorado and an M.P.A. in Environmental Policy from Indiana University.

Training Schedule

April 11, 2005 **8:00 - 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.

Inventories for Air Toxics Risk Characterization (Full Day)

Instructors: Anne Pope, US EPA
Madeleine Strum, US EPA

This course focuses on the development and use of air toxic inventories in air quality modeling for risk characterization. Hands-on exercises, using 1999 National Air Toxics Assessment (NATA) results, will be provided to students. **Laptops required.**

PM Fine Emission Inventory Preparation (Full Day)

Instructors: Tom Pace, US EPA
Roy Huntley, US EPA

This course will focus on the principal stationary source categories emitting PM fine particles. For each category, we will discuss how the National Emission Inventory emission estimates are developed, suggest activities States can do to improve upon the estimate and locate on-line resources to facilitate State inventory improvement activities. A case study will provide examples.

Emissions Modeling (8:00 am - 12:00 pm)

Instructor: Marc Houyoux US EPA

This four-hour course will have three parts which focus on preparation of emissions data for modeling..

Part 1: The first hour will include an overview of emissions modeling concepts and is intended for the novice emissions modeler. This part of the course will cover topics including general definition of terms, emissions modeling steps, file types, and how to get started with the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system.

Part 2: The next two hours will include a detailed review of emissions modeling data available from U.S. EPA, including the 2001 criteria NEI (similar to the 2002 version 1 NEI), cross-reference files, temporal and speciation profiles, default stack parameters, and spatial surrogates. The course will help modelers understand how to review these files, understand their impact on emissions modeling, and modify them for use in region-specific modeling. The datasets considered will include new temporal profiles for fires and PM2.5 speciation profiles recently developed at EPA.

Part 3: The final hour of this course will be made available for SMOKE emissions modelers to present specific questions about SMOKE and their modeling applications. Course registrants will be asked to provide their SMOKE questions 2 weeks prior to the course (by 5/24/04) to allow for preparation of responses. If no questions are received, this hour will be used as a forum for discussion of future SMOKE enhancements and their relative importance to the user community.

National Mobile Inventory Model (NMIM) (1:30pm - 5:00pm)

Instructor: Harvey Michaels, US EPA

EPA's National Mobile Inventory Model (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, including how to produce NIF3-formatted output and how to run NMIM in both standalone and distributed processing modes. This is the second NMIM training, and, in response to user demand, more emphasis will be placed on understanding the database and modifying it to customize inputs. The course will be organized around hands-on exercises, but persons without computers are also welcome. Computers will not be provided, so participants must bring their own laptops running Windows 2000 or newer operating systems, with a CD drive, a minimum of 128 Mb of RAM, and a minimum of five free gigabytes of hard drive space. Participants must have NMIM pre-installed and running on their machines prior to the course. They will be told by about mid-March how to get and install the program. **Laptops Required**

April 12, 2005 **8:00 am - 12:00 pm**

2005 National Emission Inventory (NEI) Planning Workshop (8:00 am - 12:00 pm)

At this workshop the Emission Inventory Group (EIG) will present a revised version of the proposed plan that will include feedback and suggestions from State, local and tribal (S/L/T) air agencies and other interested parties. This workshop will be another opportunity to learn about and provide feedback on the proposed 2005 NEI plan. EIG's goal is to finalize plans for the 2005 NEI by June 1, 2005.

Main Topics: After a general presentation about the proposed 2005 NEI plan, the remainder of the workshop will be three breakout sessions focusing on the following issues: 1) 2005 NEI Schedule; 2) NEI Input Format (NIF) Changes; and, 3) Central Data Exchange (CDX) Quality Assurance (Pass/Fail) Tool.

Regional Planning Organization and SLT air agency personnel involved in preparing emission inventories and submitting them to the NEI, as well as, EPA Regional Office personnel, that are involved in assisting S/L/T air agencies and EPA's EIG in the development of the NEI, are encouraged to attend.

Poster Session and Exhibitors' Reception 6:00 - 8:00 pm

"Is Marlborough Carbon Neutral? An Investigation of the Greenhouse Gas Balance of the Marlborough Region, New Zealand," M. Marquardt, Landcare Research NZ ltd; S. R. Sherlock, G. Buchan, Lincoln University, L. Turney, Landcare Research NZ, Ltd., NEW ZEALAND.

"Estimating the Spatial Distribution of Air Pollutant Emissions in Japan Using G-BEAMS," K. Nansai, N. Suzuki, K. Tanabe, S. Kobayashi, Y. Moriguchi, National Institute for Environmental Studies, JAPAN.

"Data Summaries of the National Emissions Inventory Available on the Web," M. Salhotra, F. Divita, E. H. Pechan & Associates; T. Helms, B. Gilbert, US EPA.

"Presentation of the AES*Online and AES*XML Emission Inventory Application," B. E. Lane, CIBER, Inc.

"Use of Laser Technology to Monitor Ammonia Emissions from Dairy Lagoons," D. Goorahoo, C. Krauter, L. B. Goodrich, M. Beene, California State University-Fresno.

"Comparison of Active Filter Pack and Open Path Tunable Diode Laser Measurements for Ammonia from California Dairies," L. B. Goodrich, C. Krauter, D. Goorahoo, and M. Beene, California State University - Fresno.

"Ammonia Emissions from Sidress and Waterun Fertilizer Application Methods in California Cotton," M. Beene, B. Goodrich, C. Krauter, D. Goorahoo, California State University - Fresno.

"Assessing Post 1990 Clean Air Act CAA NO_x Programs: An Emission Inventory Perspective," D. Solomon, US EPA.

"Review Your Draft 2002 National Emission Inventory Point Source," M. Vines, Eastern Research Group; A. Pope and D. Brown, US EPA.

"Use of Local Travel Data in Mobile6: Recent Advancements in Agency Practice, and an Introduction to FHWA's New Emit Model," M. Claggett, J. Houk, Federal Highway Administration Resource Center.

"Evaluation of PM10 Emission Factors from Almond Harvest Operations in San Joaquin Valley," T. Cassel, K. Trzepla-Nabaglo, P. Wakabayashi, R. Flocchini, University of California - Davis.

"Native American Tribal Emission Inventories, A 2005 Update," S. Kelly, A. Luedeker, Institute for Tribal Environmental Professionals.

"Development of Integrated NATA Data Tool for the NATA Web Site - Enabling Communities to Better Visualize Air Toxics Emissions, Concentrations, and Risk," R. Mason, National Oceanic and Atmospheric Administration; M. Strum, A. Pope, J. Touma, L. Driver and T. Driscoll, US EPA.

"Quality Assurance of Emission Inventories Using Visual and Geographical Techniques," D. Misenheimer, R. Huntley, US EPA.

"Adaptation of SMOKE to Prepare Emissions Files for Two Canadian Air Quality Models, ABRAMS and CHRONOS," L. Crevier, M. Sassi, P. Makar, M. Moran, Meteorological Service of Canada; E. Giroux, W. Jiang, National Research Council of Canada.

Poster Session and Exhibitors' Reception (Continued)

"Lessons Learned from the Inventory Exercise at Yale University: GHG Emissions from Transportation,"M. Buttazzoni, Environmental Resources Trust; K. Zyla Pew Center for Global Climate Change.

"Development of a Fireplace Baseline Particulate Emission Factor Database," D. Broderick, J. Houck, OMNI Consulting Services.

"Regional Haze Modeling Inventories for the MANE-VU and CENRAP Regions," S. M. Roe and R.P. Strait, E.H. Pechan & Associates.

"Evaluating HAP Trends: A Look at Emissions, Concentrations, and Regulation Analyses for Selected Metropolitan Statistical Areas (MSAs)," R. Oommen, J. Houser, D. Dayton, and G. Brooks, Eastern Research Group, Inc.

"Windblown Dust Control for Alluvial Soil," P. DeNee, Arizona Department of Environmental Quality.

"Minerals Management Service Gulf of Mexico Emissions Inventories," H. Ensz, Minerals Management Service; D. Wilson, Eastern Research Group, Inc.

"Developing Manure-DNDC: Building a process Based Biogeochemical Toll for Quantifying NH_3, CH_4 and N_2O Emissions from California Dairies," W. Salas, Applied Geosolutions; C. Li, University of New Hampshire.

"EmisView: New Software for Visualizing and Quality Assuring Emission Modeling Data," A. M. Eyth, University of North Carolina, Chapel Hill; M. R. Houyoux, US EPA.

Wednesday, April 13, 2005

Session 1 Agricultural/Ammonia Sources

Chairs: Patrick Gaffney, CA Air Resources Board
Thomas Pierce, US EPA

8:00 am "Odor, Dust and Gaseous Emissions for Open-Lot CAFOs: Southern Great Plains," J. M. Sweeten, Texas A&M University (TAMU); D. Parker, WTAMU; B. Auvermann, TCE/TAES; A. Cole, USDA; C. Parnell, TAMU, R. Maghriang, J. P. Murphy, Kansas State University and B. Einheimer, Texas Cattle Feeders Assn.

Particulate matter (PM), ammonia, odor, and gaseous emissions from open-lot cattle feedlots and dairies in the semi-arid Southern Great Plains are a concern to producers, rural residents, and regulatory agencies. A multi-agency, multidisciplinary team funded by USDA-CSREES is conducting a 4-year research and technology transfer project to address 5 objectives: (1) accurate characterization of PM, ammonia, odor, odorous gases (VOC's, H2S, etc); (2) Develop effective abatement strategies; (3) develop scientific basis for improved emission factors and process models, including appropriate dispersion modeling; (4) determine cattle health and performance parameters affected by PM; and (5) effective technology transfer. The coordinated research projects involve 23 scientists from 5 institutions including Texas A&M University System components (Texas Agricultural Experiment Station (TAES), Texas Cooperative Extension (TCE), West Texas A&M University (WTAMU)), Kansas State University (KSU), and USDA-Agricultural Research Service (ARS). Two years of research have been completed in which the PIs monitored emissions from open-lot cattle feedlots in the Texas Panhandle and southwest Kansas and from dairies in North Central Texas. Emission sources included: open lot pen surfaces, entire feedyards, holding ponds and lagoons, and free-stall dairy barns. Evaporation rates from feedlot surfaces are determined in relation to evapotranspiration rates and weather variables to foster development of PM (dust) control systems using water spraying, water curtain, or surface mulches. Chemical controls of ammonia include denitrification inhibitors or humates. Fundamental factors involved in PM generation and emission have been identified. The project team provided 19 technical papers at the 2004 ASAE/CSAE meeting in Ottawa.

8:30 am "Monitoring and Modeling of ROG at California Dairies," C. Krauter, B. Goodrich, D. Goorahoo, and M. Beene, California State University - Fresno. **ALSO IN POSTER**

Three dairies in the Central Valley of California were sampled for Reactive Organic Gasses (ROG) and ammonia flux profiles from the fall of 2002 through the summer of 2004. Sampling was conducted every three months to evaluate seasonal differences. Sampling locations at each dairy included an upwind site and sites downwind of significant dairy operations such as the animal containment, feed storage areas, the lagoon and surrounding cropland. The ROG samples were collected over a two hour period in canisters and analyzed by GCFID and GCMS for total non-methane hydrocarbons (TNMHC) and speciation of TNMHC. Wind along with other meteorological data was collected to assist in calculating emission factors for ROG and ammonia. The field data was modeled using the Industrial Source Complex Short Term version 3 (ISC-STv3). It is a steady state Gaussian plume model that can be used to predict downwind concentration from area sources. The inputs for the model include the relative placement of sources and receptor locations, as well as recorded meteorological conditions and emission fluxes. The output from the model is the predicted concentration at the selected receptor locations. Emissions calculated from the modeled field data are not available at this time (October, 2004). The modeling will be completed and emissions estimated by the early spring of 2005.

9:00 am "Assessment of Reactive Organic Gases and Amines from a Northern California Dairy Using the US EPA Surface Emissions Isolation Flux Chamber," C. E. Schmidt, Environmental Consultant; T. Card, Environmental Management Consulting and P. Gaffney, California Air Resources Board; S. Hoyt, Environmental Analytical Services. **ALSO IN POSTER**

The Central California Ozone Study (CCOS) group has sponsored a field study managed by the California Air Resources Board (CARB) to evaluate the air emissions of reactive organic gases (ROGs) and amine compounds by flushed lane dairies in Northern California. The goal of the research is to provide process-specific dairy emissions data for use in improving emission estimates required for State Implementation Plans (SIPs) and California Senate Bill 700 (Florez).

The technical approach was developed for a two-phase program to assess air emissions from ten common 'unit process' found at a flushed lane dairy, including: flushed lanes (pre and post water flush), solids storage piles, flush and rinse water storage lagoons, solids in solids separator, free stall areas, turnout areas (corral), heifer pens, open feed storage, and milk parlor area. The emphasis of Phase 1 of the research was to identify all major sources of air emissions, rank the emission sources, and identify all significant compound emissions from the dairy (e.g., type of compounds emitted). The area source emissions were measured using the USEPA surface emissions isolation flux chamber (flux chamber) and gas samples were collected from the flux chamber for quantitative analysis of ROG and amine compounds. USEPA Method TO-15 was performed at all test locations for speciated ROG emissions (gas chromatography/mass spectrometry) using an extended list, as well as amine compounds analyzed by NIOSH Method 2010 (ion chromatography). Some locations were selected for analysis of aldehydes and ketones (USEPA Method TO-5), volatile organic acid compounds (gas chromatography/mass spectrometry), and fixed gases by ASTM Method 1945. The testing was performed during the summer season, and those test locations subject to solar heating were tested as a function of time of day. All unit process were tested at multiple locations over a two-day time period, and screening analysis was performed assessing spatial variability where needed.

Flux data are reported as unit emission factors for each unit process or unique area source as well as area emission estimates per process, which were summed per test area to generate site dairy emissions and air emissions per compound per cow (estimated using dairy operating data). These data were compared to earlier studies conducted by EPA Region 9 and the South Coast Air Quality Management District. The results of the Phase 1 effort are discussed and the objects of the follow-on Phase 2 research effort are also presented.

Wednesday, April 13, 2005

Session 1 Agricultural/Ammonia Sources

Chairs: Patrick Gaffney, CA Air Resources Board
Thomas Pierce, US EPA

9:30 am "Use of Laser Technology to Monitor Ammonia Emissions from Dairy Lagoons," D. Goorahoo, C. Krauter, L. B. Goodrich and M. Beene, California State University, Fresno. **ALSO IN POSTER**

Ammonia emissions from dairies have been identified as a major contributor to the San Joaquin Valley, CA, air problem. Our research is currently aimed at identifying and managing these emissions. On a dairy, a source of emissions comes from the dairy effluent filled lagoons. Firstly, we will review the technology involved in the use of open path tunable diode laser (OPTDL) for monitoring ammonia emissions. Then we will present some of our research data collected to highlight the applicability of the OPTDL for monitoring diurnal and seasonal fluctuations of ammonia during various dairy management practices. For example, in a management system comprising of acidification of the dairy effluent acidification coupled with aeration and freshwater addition, we have been able to detect ammonia fluctuations as the pH and oxidation reduction potential levels of the lagoon water change. In summary, we found that as the pH of the lagoon dropped from 8.0 to 6.5, average NH_3 fluxes decreased from approximately 1.6 to 0.5 mg/m^2/s. Generally, relatively high gas fluxes were detected at the start of the aeration, probably due to agitation of the lagoon, followed by a gradual reduction as the lagoon was subjected to further aeration, acidification, and fresh water addition. We will conclude the presentation with a discussion on the potential use the TDL data for validation and assessment of the EPA model for predicting downwind concentrations from area sources.

10:00 am BREAK

10:30 am "An Improved Process Based Ammonia Emission Model for Agricultural Sources Emission Estimates," G. E. Mansell, ENVIRON International Corporation; Z. Wang, University of California Riverside; R. Zhang and J. Fadel, University of California - Davis; H. Xin, Iowa State University; J. Arogo, North Carolina State University and T. Rumsey, University of California - Davis.

Ammonia is an important atmospheric pollutant that combines with sulfuric acid and nitric acid to form aerosol sulfates and nitrate, respectively. These aerosol species are major components of fine particulate matter (PM) and contribute significantly to visibility impairment. Estimates of ammonia emission factors are both highly variable and uncertain. Emissions factors vary depending on meteorological conditions and seasonal and regional differences in farming practices. Previous ammonia emissions inventories have not adequately characterized seasonal practices. Recent chemical transport modeling suggests that daily and hourly variability in ammonia emissions is required to model arcuately the formation of ammonia nitrate and ammonium sulfates.

In a companion paper, the development of a process-based model for predicting or estimating ammonia emission rates and factors from individual or group animal feeding operations at local, regional and national levels was presented. This paper presents and discusses preliminary emission estimates developed from the process-based ammonia emission model. Detailed description of databases used as input values for the process-developed model and recommendations for future improvement on the farm-based data regarding the animal feeding and manure management practices are documented. Comparisons of the new ammonia emission estimates with existing ammonia emission inventories for livestock farms at a local, regional and national level are presented.

11:00 am "An Improved Process Based Ammonia Emission Model for Agricultural Sources - Model Development," R. Zhang, J. Fadel and T. Rumsey, University of California-Davis; J. Arogo, North Carolina State University; H. Xin, Iowa State University; G. E. Mansell, ENVIRON International Corporation and Z. Wang, University of California - Riverside.

Ammonia is an important atmospheric pollutant that combines with sulfuric acid and nitric acid to form aerosol sulfates and nitrate, respectively. These aerosol species are major components of fine particulate matter (PM) and contribute significantly to visibility impairment. Estimates of ammonia emission factors are both highly variable and uncertain. Emissions factors vary depending on meteorological conditions and seasonal and regional differences in production and management practices. Previous ammonia emissions inventories have not adequately characterized seasonal and geographical variations in emissions factors. Recent chemical transport modeling suggests that daily and hourly variability in ammonia emissions is required to model accurately the formation of ammonium nitrate and ammonium sulfates.

This paper discusses the development of a process-based model for predicting or estimating ammonia emission rates and factors from individual or a group of animal feeding operations (AFOs) at local, regional and national levels. Both mechanistic and mass balance approaches are used to formulate mathematical models that describe the ammonia generation and emission processes. The following three ammonia emission sources for a typical AFO are considered: animal housing, manure treatment and/or storage, and land application. The animal species considered include dairy cattle, beef cattle, swine and poultry (layers, broilers and turkeys). For each livestock type the processes modeled include ammonia and nitrogen excretion from animals, animal housing, manure storage/treatment and land application, and the effects of animal feeding, manure management practices and site-specific meteorological conditions (temperature and wind speed) are analyzed. National farming practices are incorporated at the county-level using a statistical modeling approach to reflect variation in local farming practices.

The process-based model is developed as a suite of sub-models, one for each of the ammonia emission source processes, and will be incorporated into the CONsolidated Community Emissions Processing Tool (CONCEPT), an open source, public domain emission modeling system. Model development, data requirements and sources, and model implementation are discussed.

11:30 am "Quality Improvement for Ammonia Emission Inventory," J. Fu, Y. Kim, W. Davis and T. Miller, University of Tennessee.

Ammonia gas reactions in the atmosphere are a significant source of PM2.5. Due to the increasing concentration of PM2.5 in atmosphere, the need for improved ammonia emission inventories has become an increasingly important air quality issue. A comparison is shown of ammonia inventory data from CMU (Carnegie Mellon University) based on the years 1996 and 1997, and NET99 (EPA's National Emission Trends database for 1999). The CMU data include most source categories but not soil and vegetation. NET99 appears to underestimate emissions for area and point sources in some southeast states, and it lacks details about emission categories such as a breakdown of livestock and domestic sources. NET99 also has incomplete activity information that is needed to provide details about sub-source categories in a county. This study presents the improved ammonia emission estimates that were developed for each county in Tennessee. This study produced ammonia emission estimates for ten source categories and fifty-four sub-source categories for the State of Tennessee on a county basis for the year 1999.

Results show that livestock is a major source of total ammonia emissions in Tennessee, responsible for emitting 88,000 tons per year, with beef cows emitting 45,000 tons of ammonia emissions and forming the biggest sub-source category within the livestock category. Even though soil may be an uncertain source category of ammonia emissions and some double counting of emissions may occur in the fertilizer source category, soil was estimated to emit 61,000 tons of ammonia emissions as the second highest contributor. In some urban counties in Tennessee, mobile sources were the largest source of ammonia emissions. The study includes recommendations for the use of spatial surrogates to allocate emissions for area sources, and temporal profiles for allocating emissions by season and time of day.

Session 2 Data Management

Chairs: Steve Boone, E. H. Pechan and Associates
Heather Hawkins, North Carolina DENR

8:00 am "Development and Use of GIS Emissions Analysis Tool to Estimate the Probability of Regional Source Contributions to Haze," S. M. Raffuse, S. G. Brown, D. C. Sullivan, T. H. Funk and L. R. Chinkin, Sonoma Technology, Inc.

A customized geographic information system (GIS) spatial mapping tool was developed to aid in the characterization of relationships between emissions trends and ambient observations. The tool, called the probability of regional source contribution to haze (PORSCH), combines back-trajectory meteorological analyses with emission inventories to calculate or visualize emissions source regions most likely to impact a user-selected site. PORSCH weights emissions geographically, temporally, and according to trajectory probability distributions. Thus, emissions that are most likely to affect the location of ambient measurement are more heavily weighted in the correlation analyses.

PORSCH is currently being used to facilitate an analysis of historical emissions trends and visibility conditions in Class I areas, and results of this analysis will be presented. Statistical correlations indicate the source categories and geographic distributions of emissions that have historically affected visibility conditions in Class I areas. They may also serve as predictors of the potential effects of future controls or limits on emissions. Analyses based on trend correlations can be valuable components of integrated, corroborative research projects, which, when taken as a whole body of evidence, can be highly effective tools for developing conceptual models of regional haze phenomena, planning photochemical modeling efforts, and selecting control strategies.

8:30 am "Development and Implementation of an Inter-RPO Emissions Inventory Warehouse System," M. Schuster, S. Kayin, MARAMA.

The purpose of this paper is to discuss the development and implementation of a data warehouse system designed to manage, store and report emissions inventory data including ancillary modeling files. The system is web-based with the capability of performing versioning and limited quality control. The system will allow users from across the country to input and export data. Guidance and decisions for this project have been made by an Inter-RPO technical oversight committee.

9:00 am "Supporting Spain's National Emission Projections with the EMIPRO Tool," R. Borge, J. Lumbreras, M. E. Rodriguez, Universidad Politecnica de Madrid; I. Casillas, Telecommunications Engineer, SPAIN.

The "Universidad Politécnica de Madrid" (UPM) has recently finished the first stage of the SEP (Spain's Emission Projection) project, under contract with the Ministry of Environment of Spain. In order to evaluate the alternatives to improve Air Quality, yearly emissions up to 2020 have been projected under several scenarios, compatible with the CAFÉ (Clean Air For Europe) program methodology.

Such a study involves the future emission assessment for all the sources taken into account in the National Emission Inventory (NEI). That means that all sectors (public power generation, transport, industry, agriculture, etc.) have to be projected. The emission projections have been made in accordance to the Selected Nomenclature for Air Pollution (SNAP), developed as part of the CORINAIR project (EU). Each activity (the lower hierarchical level in this nomenclature) has its own peculiarities, input data sources and specific projection methods. Some of the emissions are computed according to a bottom-up approach and others are estimated following a top-down approach. The SEP methodology provides a flexible framework to project emission and allows the consideration of very-specific hypothesis for each activity. This also makes the technological and economical assessment of the measures considered under each scenario easy.

However, eventually all the individual projections have to be merged in order to estimate the national projections. Since input information might come from a wide range of sources, it is indispensable to develop methods to assure that individual projections are compatible. That is, there is no contradiction in trends or particular values for the variables involved in projection estimation at activity level, and therefore, they can be summed in a fully consistent way. This is accomplished by defining "macroscenarios" and reducing all the projections to a common basis. Firstly, all activity-level projections are transformed into a product of annual activity rate, emission factors, and other factors (control, penetration, etc.). Then the information is put into EmiPro, where "macroescenarios" have been previously defined. A macroscenario is a group of activities related by the activity rate or emission growth rate. Once EmiPro has been fed with this raw data, the projections are recalculated and the consistency can be checked inside a given macroscenario.

EmiPro is a piece of software designed to implement the SEP's methods. It is intended not only to support the projections QC/QA, but also to assure consistency with the NEI database. In addition, it includes a set of utilities for organizing the work and for reporting to the Ministry.

Wednesday, April 13, 2005

Session 2 Data Management

Chairs: Steve Boone, E. H. Pechan and Associates
Heather Hawkins, North Carolina DENR

9:30 am "The Emissions Inventory Database Application Component of the Air Quality Management Decision Support System for Beijing," J. E. Brandmeyer, E. Solano, R. A. Zerbonia, RTI International; G. Gao, PA Consulting Group, L. Xin, C. Tian, S. Aijun, Beijing Municipal Environmental Protection Bureau, Beijing, CHINA.

An integrated air quality management decision support system (AQMDSS) is being constructed to help the Beijing Municipal Environmental Protection Bureau improve air quality for the 2008 Olympics and beyond. This region of China experiences poor air quality from multiple pollutants of concern, requiring the one-atmosphere approach to modeling. This AQMDSS will integrate tools for emissions inventory development and processing, industrial-scale air dispersion modeling, regional-scale photochemical modeling, and geospatial data analysis.

The emissions inventory database is at the core of the AQMDSS. The database layout was constructed from a needs analysis of the models and processors that will use it. The National Emissions Inventory (NEI) Input Format (NIF) version 3 was the starting point for the design. Some fields (e.g., country code) and tables (e.g., temporal factors, cross-reference tables) were added to support source models, emission processors, GIS analyses, and other models. Referential integrity and range checks were built into the database definition where appropriate.

A graphical user interface (GUI) allows the user to enter and update data. Input forms reduce data entry errors by providing drop-down boxes and look-up capabilities for all codes. Also, construction of the forms supports the parent/child data relationships between tables in the database. The GUIs support a multi-lingual user interface. The initial version will be available in both English and Chinese. The application is also extensible, allowing more quality assurance (QA) tools to be easily added in the future.

10:00 am BREAK

10:30 am "Developing an Integrated Approach to Meeting a State's Air Quality Data Needs, Encompassing Emission Inventory, Fees and Billing, Permits Development and Issuance, Compliance Monitoring and Enforcement, Source Testing, Ambient Monitoring, SIP Strategy Development and Other Related Aspects, Including Reporting to EPA," J. H. Southerland, T. Manning, H. Groce, S. Nunna, A. Hall, North Carolina Department of Environment and Natural Resources.

North Carolina has developed several modules of a database that is envisioned to eventually encompass all elements of a state air quality management program. These modules share data elements that have universal field descriptions and field lengths (with exceptions where unique and justifiable differences must be maintained) through all modules. The data model tables resulting are large and complex. However, the data entry stored in these tables is accessible to any module in the system as needed. This system is not yet complete, nor will it be as it continues to be enhanced and to grow as the needs of the program grow and as resources allow the application of more and more inter-relationships. The costs of engineering and IT resources are discussed in some detail and contrasted with costs of using paper inventory forms, redundant or overlapping (not interrelated) systems and other data entry and quality assurance aspects.

This paper is intended to convey the concepts utilized in building this system to date, give some pointers to others on the hazards and benefits of such inter-organizational coordination, sharing of data, data entry efficiencies and discuss lessons learned. The discussions will not provide a template for the use of other agencies to build a duplicate system, but point out how such a system could be best conceived to meet the needs of the specific agency within a reasonable cost allowance, and result in an even better system than North Carolina DAQ now enjoys. Some enlightenment of how these data interface with multimedia data from other "sister" agencies in North Carolina up through EPA's master data system will be attempted.

11:00 am "Emission Data Management System for the Western Regional Air Partnership," S. Boone, D. Holoman, E. H. Pechan and Associates, Inc.

The Emissions Data Management System (EDMS) is an emission inventory data warehouse and web-based application that provides a consistent approach to regional emissions tracking to meet the requirements for State Implementation Plan (SIP) and Tribal Implementation Plan (TIP) development and periodic review and updates. The EDMS serves as a central regional emissions inventory database and associated software to facilitate the data collection efforts for regional modeling, 309 tracking, and resulting data analyses. The EDMS is the central repository for the data from the Western Regional Air Partnership (WRAP) region that is used initially for air quality modeling in pursuit of meeting the requirements of the United States Environmental Protection Agency's (EPA) regional haze rule (RHR). The emission inventories contained within the EDMS consist of visibility impairing pollutants that are released into the atmosphere by the different source sectors.

11:30 am "Streamlining State Emissions Inventory Data Management and Development Processes: The Texas Commission on Environmental Quality (TCEQ) SIP EDMS," G. Kitzmiller, W. Gerber, J. Veysey, Eastern Research Group; J. Westphal, D. Wahrmund, D. Preusse, M. Torres, Texas Commission on Environmental Quality.

The Texas Commission on Environmental Quality (TCEQ) uses emissions data from a variety of sources to support state implementation plan and US EPA reporting requirements, including information from both internal stakeholders and external (e.g., council of government and other local planning organizations) stakeholders. In the past, TCEQ used labor intensive and sometimes manual processes to warehouse and manage emissions data, as well as to compare and combine inventory data sources to meet reporting requirements.

ERG developed for TCEQ a web-based tool, the State Implementation Plan Emissions Data Management system (SIP EDMS). SIP EDMS allows users to upload, manage, query, and report on inventory data submitted to or generated by TCEQ. TCEQ can also store in the database, search for, and retrieve documentation related to the uploaded inventory data. The documentation can be in virtually any electronic file format.

SIP EDMS also streamlines the inventory preparation process by allowing TCEQ users, through the web interface, to use an inventory emissions data Comparison Tool. The Comparison Tool allows for display, side-by-side, of a number of sources of emissions data by location, location group, SCC, or SCC class. The data can be sorted on-screen to assist in the identification of outliers, and statistics such as percent of inventory total or subinventory total can also be displayed. Additional statistics that indicate how the sources of data relate to one another, such as difference and percent difference can also be displayed.

Building on the Comparison Tool, SIP EDMS also includes an Audit/Merge, or Inventory Builder, Tool. To support combining the best inventory data sources to create a new inventory in an automated manner, an Inventory Audit Manager, Inventory Auditors (i.e., data reviewers), and Peer Reviewers can be assigned to certain blocks of data, such as emissions by SCC or SCC class. The Auditors then use the Comparison Tool to review various sources of emission data; select the most representative data; and document their selection criteria and reasoning. Peer Reviewers can then view the data selections and documentation and comment as appropriate. SIP EDMS identifies any conflicts between Auditor and Peer Reviewers to be resolved by the Audit Manager. After conflicts are resolved, the Inventory Audit Manager directs SIP EDMS to combine the selected data to create a new inventory data file; QA the new inventory using EPA format and content checks as well as additional data reasonableness checks; and export the inventory in NIF 3.0 format for submission to EPA. SIP EDMS also maintains a clear audit trail that can be used to recreate earlier saved versions of an inventory.

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Session 3 Greenhouse Gases

Chairs: Wiley Barbour, Environmental Resource Trust
Joe Mangino, Eastern Research Group

8:00 am "Climate Leadership in Parks (CLIP) Tool: Helping National Parks Quantify and Reduce Greenhouse Gases," A. Choate, B. Moore, ICF Consulting; K. Scott, US EPA; A. Worstell, National Park Service.

The U.S. Environmental Protection Agency and the National Park Service are unveiling the Climate Leadership in Parks (CLIP) tool, the latest addition to the Climate Friendly Parks (CFP) program. This tool assists national parks in developing comprehensive greenhouse gas (GHG) and criteria air pollutant (CAP) inventories, as well as identifying and quantifying potential reductions through various mitigation and outreach strategies. The CFP program is a partnership between EPA and NPS, and encourages GHG and CAP emission mitigation through education and demonstration of climate friendly activities in the national parks. Recognizing that the national park system is an excellent resource for educating a large number of people about GHG and CAP emissions and mitigation, the Climate Friendly Parks program seeks to educate park personnel on emission sources, ways to reduce emissions, and outreach strategies for educating the millions of people that visit the national parks each year. The program encourages parks to take actions to reduce in-park emissions while simultaneously ramping up climate change education and outreach efforts. One of the first steps in signing on to the Climate Friendly Parks program is for parks to develop a comprehensive inventory of GHG and CAP emissions. Because park-specific inventories can very labor-intensive endeavors, EPA and NPS funded the development of the CLIP tool. CLIP helps parks develop an emissions baseline that forms the backbone of their plan to reduce emissions. The baselines will include emissions from all relative sectors, such as transportation, electricity use, and forestry. At the end of one year, the park can evaluate how much its actions have reduced baseline emissions. CLIP also assists parks in identifying mitigation strategies and quantifying the potential emission reductions from these strategies. The emissions baseline and mitigation strategies developed in CLIP can then be used as a basis for a report to the park superintendent on setting reduction goals, budgets, and taking actions.

8:30 am "A Common-Sense Approach to Information Management for Corporate Greenhouse Gas Inventory," K. Tanger, E. Isoun, Project Performance Corporation.

Industry representatives and greenhouse gas (GHG) inventory managers identify data collecting and reporting to be the single largest barrier to companies' participating in voluntary emissions reporting. Even companies who tracked GHG emissions for many years find the increasing rigor of GHG reporting burdening. Guidance documents on GHG inventorying and reporting provide extensive detail on the scope and rationale of reporting. Examples of such guidance documents include the GHG Protocol (developed by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD)) and voluntary government program guidance (e.g. Environmental Protection Agency (EPA) Climate Leaders and Department of Energy 1605 (b)). However, there remains a void in defining the best approaches to managing information for GHG inventorying and reporting.

Comprised of collecting, analyzing, and reporting data, the management of information for GHG inventorying and reporting can be overwhelming and is perceived as potentially time-consuming and costly. However, application of a common-sense approach to GHG information management can ensure cost-effective and strategic data management decisions. While not elaborate, this approach focuses on the introduction of disciplined thought process to create information management tools that make companies more efficient, comprehensive, and accurate in their calculation of GHG inventories.

9:00 am "Lessons Learned from the Yale University Inventory: GHG Emissions from Transportation," M. Buttazzoni, Environmental Resources Trust; K. Zyla, Pew Center on Global Climate Change. **ALSO IN POSTER**

In Fall 2003, the authors were part of a team that conducted a greenhouse gas inventory of Yale University. This paper discusses the methodologies and challenges faced in one sector of the inventory: emissions from transportation. The scope of this section was considered more broadly than is often done for institutional inventories. Instead of simply including direct fleet-based emissions (Scope 1 of the WRI protocol), we included Scope 3 emissions as well, taking into account university-related travel and faculty/staff/student commuting.

Attempts to quantify these less-defined categories of travel required methodologies and conversion factors quite different from those used in the more straightforward fleet calculations, and raised an additional set of challenges and uncertainties. Here we will describe the scope of the Yale transportation inventory and discuss the approach used in calculating these emissions, describing the simulation and uncertainty analysis tools we created. We conclude that many of the unique set of difficulties faced in this analysis are caused by a lack of methodologies and factors that are fully codified and shared across the GHG emission inventory community. To address this challenge, we propose a set of methodologies and benchmarks that could be adopted by the GHG emissions inventory community to facilitate future inventories of emissions from transportation.

Wednesday, April 13, 2005

Session 3 Greenhouse Gases

Chairs: Wiley Barbour, Environmental Resource Trust
Joe Mangino, Eastern Research Group

9:30 am Corporate GHG Emissions Inventory Lessons Learned: Protocols, Verifications, and Data Management Systems," K. L. Johnson, M. Campbell, URS Corporation.

10:00 am BREAK

Session 4 Tribal Emission Inventories

Chairs: Sara Kelly, Inst for Tribal Environmental Professionals

10:30 am "Gila River Indian Community (GRIC) Air Emissions Inventory," D. C. Blair, Gila River Indian Community.

The Gila River Indian Community, a federally-recognized tribe, is a rural community located on 374,000 acres in south-central Arizona. It is located south of and borders on the cities of Phoenix, Tempe and Chandler. The Phoenix metropolitan area is one of the fasts growing areas in the nation. The Community has an on-reservation population of approximately 15,000 people. A portion of the GRIC (92,000 acres) lies within Maricopa County. This portion of the GRIC was designated as a Federal Non-Attainment Area for PM10, carbon monoxide and ozone in the 1970's. EPA classified the Non-Attainment areas as serious. GRIC was included in the non-attainment areas because the Maricopa County portion of the reservation is in the Maricopa Association of Governments Metropolitan Statistical area.

The Community houses approximately 45 industrial facilities and currently has approximately 40,000 acres of agricultural land under production. The Community is in the process of expanding their agricultural acreage to approximately 140,000 acres. In addition, Interstate 10 runs between Phoenix and Tucson bisecting the Community. There are other area sources of air pollution within the Community including unpaved roads and open burning. An ongoing concern for the Community is the transport of air pollution from neighboring jurisdictions.

The GRIC received assistance on September 27, 1996 from EPA under Section 103 of the CAA for development of a needs assessment and emissions inventory. An air quality specialist was hired on November 10, 1997 and a comprehensive needs assessment and emissions inventory were completed in October 1998. The emissions inventory is a comprehensive and accurate accounting of air pollutant emissions from sources located within the Community. The GRIC emissions inventory documented emissions from all sources within the Community including, industrial facilities, paved and unpaved roads, Mobile sources, non-road mobile sources, area sources and nonanthropogenic sources. The GRIC emissions inventory was further broken down to emissions from the non-attainment area portions of GRIC and attainment portions of GRIC. This information was used to compare to neighboring jurisdictions to determine if GRIC sources have any impact on the non-attainment status of neighboring jurisdictions.

11:00 am "Native American Tribal Emission Inventories, A 2005 Update," S. Kelly, A. Luedeker, Institute for Tribal Environmental Professionals. **ALSO IN POSTER**

In the years between 1990 and 2000, tribes completing emission inventories used them in their own communities and tribal air programs. The main reasons for conducting an EI were to identify sources of air pollution that were affecting the health of community members and to determine the need for a continuing air quality program and/or air quality monitoring. In 2001, the US EPA's Office of Air Quality Planning and Standards (OAQPS) recognized the need to provide tribes with assistance in submitting their data to the National Emission Inventory (NEI) database. Through a project funded by both OAQPS and the Tribal Data Development Working Group (TDDWG) of the Western Regional Air Partnership (WRAP), the Institute for Tribal Environmental Professionals (ITEP) raised the number of tribes represented in the 1999 NEI from 1 to 12. This project is continuing with efforts to increase the number of tribes represented in the 2002 NEI. At the end of 2004, 18 tribes had released their data to the NEI.

This paper presents a summary of the source types and pollutants inventoried by US tribes by the end of 2004. The future of tribal emission inventories will also be discussed. Opportunities for tribes partnering with state, local and federal agencies to improve inventories will be presented.

11:30 am "Developing Air Emissions Inventories for Two Rural Tribes in Montana," A. Bynum, J. Killeagle, A. Dreesbach, Portage Environmental, Inc.

In 2004, Portage Environmental (Native owned) conducted a number of air emissions studies in Indian Country. First, Portage prepared two separate baseline, level 1 air emissions inventories, one for the Crow Reservation, and one for the Rocky Boys Reservation. Portage also collected the activity data for the Flathead Reservation and completed a 2002 emission inventory update for the Fort Belknap Indian Community, all in the state of Montana. With the exception of Fort Belknap all work was conducted under a national contract with the Environmental Protection Agency. The reservations in Montana are relatively remote and undeveloped by most urban standards. The northern portion of the Flathead Reservation may be the only exception but still, it is relatively rural. The purpose of the emission inventory was to establish air emissions baselines for future development and air quality management and planning, modeling and for tracking the effects of future development. Criteria emissions were quantified for calendar year 2002 and included emissions from both stationary (point and area) and mobile sources. Stationary sources include primarily combustion and biogenic sources. Mobile sources include privately owned vehicles belonging to residents as well as service trucks, buses, and automobiles that visit the reservations. In addition, agricultural activities, timber harvest activities and residential wood smoke were also considered. Emission estimates were used when actual data was not available. Emissions were calculated for criteria pollutants using varying methodologies. This paper will discuss the methodologies used to estimate emissions from the various source categories and will present an analysis and discussion of the emissions baseline and its implications for future development and air quality planning. It will describe the unique attributes of collecting data within reservations and the areas surrounding them, and describe source categories identified in the inventories.

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Wednesday, April 13, 2005

Session 5 Emission Inventory Validation and Quality Assurance

Chairs: Sally Dombrowski, US EPA
Joshua Fu, University of Tennessee

1:30 pm "EmisView: New Software for Visualizing and Quality Assuring Emission Modeling Data." A. M. Eyth, University of North Carolina-Chapel Hill; M. R. Houyoux, U.S. EPA. **ALSO IN POSTER**

EmisView is a new open-source visualization tool that improves the quality assurance of emissions data for use in air quality modeling efforts of states, Regional Planning Organizations (RPOs), and the U.S. Environmental Protection Agency (EPA). It works closely with emission models, including the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system; the CONsolidated Community Emissions Processing Tool (CONCEPT), which is currently under development by the Midwest RPO; and the Emission Processing System (EPS) Version 2.5. The analyses and graphics created by EmisView can be configured and repeated in an automated fashion. The first version of EmisView will be released in Spring 2005 under a GNU Public License, which will enable modelers to understand its workings and enhance it as needed. EmisView will be developed to perform analyses that the states, RPOs, and EPA have identified as priorities.

2:00 pm "Quality Assurance of Emission Inventories Using Visual and Geographical Techniques," D. Misenheimer, R. Huntley, US EPA. **ALSO IN POSTER**

Because of the large quantity of data in emission inventories, the potential exists for many types of errors. The varied methods for calculating emissions make identification of errors a challenge. There are several approaches that must be used to identify the bulk of the errors in an emissions dataset, including visual techniques such as mapping of emissions data and visual comparisons to corresponding data sets for recent years.

This paper will present examples of visual and geographical techniques for identifying errors in emission inventories and will discuss methods for automating some GIS quality assurance approaches.

3:00 pm "Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10," T. G. Pace, US EPA.

3:30 BREAK

4:00 pm "Source Apportionment of Diesel Particulate Matter in the Southeastern United States Using Models3/CMAQ," L. A. Diaz, G. D. Reed, J. S. Fu, University of Tennessee.

Source apportionment of fine particulate matter is important to identify the sources that are responsible for the ambient concentrations observed in a particular area. The fine and ultra fine sizes of diesel particulate matter (DPM) are of greatest health concern, which significantly contributes to the overall cancer risk from air toxics. The composition of these fine and ultra fine particles is composed principally by elemental carbon (EC) with adsorbed compounds such as VOCs, sulfate, nitrate, ammonia, metals, and other trace elements. So far, EC has been used as a marker for DPM in the environment, which can be modeled temporal and spatially over an urban to a regional area. The purpose of this project was to use EPA's Models3/CMAQ advanced air quality model (version 4.3) to predict aerosol concentrations and the source apportionment of primary and secondary aerosols that come from diesel-fueled sources (DFS) with a focus on EC in the South East US by linking the MM5.3 meteorological model, the Sparse Matrix Operator Kernel Emissions (SMOKE 2.0) model, and Mobile6.2. The national emissions inventory (NEI) for the year 1999 was used for the other states. The modeling domain consisted of a 36 km domain. Five urban areas and one rural area were selected in the domain to compare the main results. A severe southeast ozone episode between August and September 1999 was used as a reference, the same as that used by the Arkansas, Tennessee, and Mississippi Ozone Study (ATMOS).

For emissions, results showed that DFS contributed by (73.7 % ± 12.6) of EC, (15.2 % ± 8.3) of organic aerosols, (12.9 % ± 6.5) of nitrate, and (7.7 % ± 6.1) of sulfate during the selected episode, where the highest contribution of EC was allocated in Memphis TN. On the other hand, for ambient concentrations, DFS contributed by (69.5% ± 6.5) of EC, (19.4% ± 11.2) of nitrate, (10.8 % ± 2.4) of primary anthropogenic organic aerosols, (8.9% ± 1.5) of total organic aerosols, (7.1% ± 1.1) of secondary anthropogenic organic aerosols, (6.9 % ± 1.3) of ammonia, (5.8% ± 0.9) of sulfate (4.4% ± 1.2) of secondary biogenic organic aerosols, and (0.08% ± 0.01) of crustal, where the highest contribution of EC due to DFS was allocated in Nashville TN. The rural site (Warren County TN) performed the smaller EC contribution of DFS. Our results indicate significant geographic variability in the EC contribution from DFS.

4:30 pm "Cleaner Data for a Better National Emission Inventory," S. Dombrowski. D. Solomon. R. Carrier, US EPA

With each development of EPA's National Emission Inventory (NEI), large amounts of resources are spent on identifying and correcting formatting and content errors in data submittals. This process makes timely completion of the inventory difficult and limits the time that can be spent on actual analysis and identification of trends. This paper will outline a new automated tool for checking NEI data at the point of submission, EPA's Central Data Exchange (CDX). This paper will describe how instant feedback on NEI XML and flat file data submissions will improve the process for both data submitter and EPA. The paper will also described EPA's plans for implementing this tool.

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Session 6 Better/Faster Emission Inventory Methodologies

Chairs: Douglas Solomon, US EPA
Bruce Lane, CIBER, Inc.

1:30 pm "The Rapid Inventory Development Pilot," D. Solomon, S. Dombrowski, US EPA; L. Harwell, C. Tillerson, R. Wagoner, MACTEC, Inc.

In the past, developing the National Emission Inventory (NEI) has taken up to two years to complete. Not only was there dissatisfaction with the timing, but the quality of the data was questioned. The Emission Inventory Group was charged with finding a solution.

The Rapid Inventory Development Pilot is a combined effort between EPA and selected states to investigate how we may significantly decrease the time period in which states collect emissions data from industrial sources, organize that data in their state databases, perform quality checks, and then transfer the data to EPA for inclusion in the NEI. The goal of the pilot is to work with the participating states to develop a complete emission inventory in 12 months.

This paper will present the method and progress in accomplishing that goal.

2:00 pm "Reinventing the NEI: A Status Report," D. Solomon, US EPA.

Over the past year, groups external to EPA (CAAAC, NARSTO), as well as management within EPA's OAQPS have called for changes to the emission inventory development process in general, and the NEI development process, specifically. EPA's Emission Inventory Group has been tracking these calls for change and is responding in a variety of ways including engaging stakeholders, pilot projects, and tool development. This paper will provide a roadmap to all the change oriented efforts the Emission Inventory Group has undertaken. Specifically, the paper will include descriptions and status reports for the following efforts:

- Stakeholder workshops on fundamentally changing the inventory development process,
- The Rapid Inventory Development Pilot Project,
- Requirements for a new NEI database system, and
- Proposed changes to the 2005 NEI Cycle.

Finally, this paper will tie together all of these efforts and explain how they fit into the long-term vision for the NEI development process.

2:30 pm "Presentation of the AES* Online and AES*XML Emission Inventory Application," B. E. Lane, V. Ramachandran, R. Lettich, K. Minnich, A. Sarode, and B. Garofalo, CIBER, Inc. **ALSO IN POSTER**

The Pennsylvania Department of Environmental Protection Bureau of Air Quality (PADEP) commissioned Ciber, Inc to create a full-featured, web-based system for the collection, reporting, review, and management of emission inventory data from regulated industries within the Commonwealth. To fulfill this initiative, Ciber, Inc. designed, developed, and implemented the AES*Online/AES*XML suite of custom applications. AES*Online is a comprehensive solution comprising two secure online applications: one that provides facilities with a mechanism to enter, edit, and submit Annual Emission Statement (AES) data to the PADEP and an associated application that allows PADEP staff to review, reject/accept, and manage the AES data. AES*XML applies the Commonwealth's AES XML schema to provide facilities with the ability to upload and submit AES data directly from their own databases or spreadsheets. The AES*Online and AES*XML systems streamline the reporting of emissions inventory data, offer real-time data validation and data quality feedback, and automate the emission inventory reporting and PADEP data review processes.

The initial implementation of AES*Online in January 2004 was met with a high level of interest and participation in the regulated community and significantly decreased the level of effort required for AES processing in the 2004 reporting season. The applications were enhanced and optimized to further strengthen the utility and popularity of the system, and participation levels increased for 2005. A pilot of the fully-automated reporting option AES*XML will be implemented in January 2005, completing the suite of PADEP online reporting options. This application shares many of the key design features of AES*Online and is focused on further reducing effort within the regulated community and supporting the overall culture of automated data management.

The AES*Online and AES*XML systems run in an Oracle environment using the Oracle 9i Application Server with access to back-end Oracle 9i databases. The Java-based user interfaces use the J2EE architecture and Oracle's suite of XML tools are employed for XML parsing and management. The development effort incorporated the use of several tools and techniques, including Java, JSP, XML, XSL, HTML, PDF and PL/SQL.

Wednesday, April 13, 2005

Session 6 Better/Faster Emission Inventory Methodologies

Chairs: Douglas Solomon, US EPA
Bruce Lane, CIBER, Inc.

3:00 pm "Compilation of the Annual Emissions Inventory in Canada for Criteria Air Contaminants," M. Deslauriers, Environment Canada.

This presentation will describe the new process that is being implemented in Canada for the compilation of the national emission inventories for Criteria Air Contaminants. Canadian Emission Inventories were compiled on a 5 year cycle since the 70's, but this frequency has been found to be no longer acceptable in recent years to meet the reporting requirements and obligations of domestic programs and international protocols and agreements. A new process has been initiated to compile the emission inventories on an annual basis using a more centralized approach for the collection of industrial emissions by Environment Canada. This new approach uses the data collection infrastructure of the National Pollutant Release Inventory (NPRI), which is Canada's Pollutant Release and Transfer Register (PRTR) program. The NPRI has been modified since 2002 to collect emissions and other related information to support the compilation of the national emissions inventory of Criteria Air Contaminants. The industrial information collected through the NPRI is supplemented with the annual estimates for the area, mobile, and natural sources of emissions, to ensure the comprehensiveness of the national emission inventory. This presentation will describe the advantages of this new process, which is contributing to the improvement of the Canadian emission inventory and its accessibility. It will also summarise the adjustments that are being proposed for the coming years.

3:30 pm BREAK

4:00 pm "Development of a Multi-User GIS-Based Emission Inventory Tool," M. Van Altena, J. W. Boulton, M. Lepage, RWDI Air Inc.; C. Di Cenzo, Environment Canada.

This paper presents an overview of the design and current status of a project to develop a multi-user GIS-based Emission Inventory Tool (GIS-EI Tool). The fundamental goal behind the GIS-EI Tool is to allow for the timely and efficient creation (from first principles), analysis, reporting, and model input creation of emission inventories by a number of simultaneous users. To accomplish this, the GIS-EI Tool must be capable of producing new (e.g., emission scenarios for modelling) or updated inventories based on changes in science (e.g., emission factors), activity data (e.g., road traffic volumes, population density), and geography (e.g., changes in the location and/or magnitude of emissions that are based on physical characteristics of geographic features such as roads, land-use, etc.).

Recognizing the advantages of sharing technical, computational, and intellectual resources, Environment Canada, Pacific and Yukon Region; the Greater Vancouver Regional District; and, the British Columbia Ministry of Water, Land, and Air Protection, together with the authors, have developed a conceptual model where emission inventory calculations, analyses, and reporting can be performed by multiple simultaneous users within one, comprehensive system.

Knowing that a strong conceptual design is paramount to the Tool's success, a rigorous design phase involving numerous iterations and consultations with different stakeholders and potential user groups was completed as a first step. The next step focussed on improving the data model (i.e., database design) and the distributed organisation of the hardware and software system and related infrastructure. Having completed this step, a prototype version of the Tool and hardware/system infrastructure designed to calculate emissions using land-use and population GIS and activity data is being developed and tested for: functionality, ease of use, system integrity, and security. Subsequent phases of this project will focus on adding the ability to calculate emissions from other activities and GIS inputs (e.g., roads, rail), adding functionality (e.g., reporting routines, etc.), improving speed, and allowing for remote, simultaneous access by multiple users.

Session 7 Fugitive Dust

Chairs: Bill Kuykendal, US EPA
Russ Merle, Clark Co, NV DEQ

1:30 pm "TRAKER: A Method for Fast Assembly and Update of Paved and Unpaved Road Dust Emission Inventories," V. Etyemezian, H. Kuhns, G. Nikolich, Desert Research Institute; D. Fitz, K. Bumiller, University of California-Riverside; R. Merle, R. Langston, Clark County Department of Air Quality & Environmental Management.

Vehicle-based measurement methods have been developed over the last several years as an alternative to AP-42 road dust emission factor estimation methods. The TRAKER (Testing Re-entrained Aerosol Kinetic Emissions from Roads) uses PM (PM10 or PM2.5) concentrations measured directly behind the front tires of a moving test vehicle – corrected for background PM levels – to measure the potential for a given segment of roadway to result in road dust emissions. Emission factors are calculated using the speed of travel and the weight characteristics of the vehicle mix. Spatially resolved emission inventories are calculated by combining TRAKER measurements with road use data from local planning agencies such as the data obtained from traffic demand models. The TRAKER has been utilized in a number of recent studies in the Boise metropolitan area, in Las Vegas, at and around Lake Tahoe, and in West Texas. The economy of measurement afforded by the TRAKER allows for a fairly quick initial assembly of a spatially resolved road dust PM emission inventory followed by rapid – less than one day – updating of the inventory to allow for temporal variations due to seasonal differences as well as changes in land use and abatement practices.

2:00 pm "TEOM - Based Measurement of Industrial Unpaved Road PM_{10}, $PM_{2.5}$ and $PM_{10-2.5}$, Emission Factors," J. Hayden, National Stone, Sand & Gravel Association; J. Richards, Air Control Techniques, P.C.

The paper concerns the application of PM_{10} Tapered Electrode Oscillating Microbalance ("TEOM") monitors in stacked arrays for the measurement of PM_{10} emission factors from unpaved roads at two sand and gravel operations in California. The TEOMs provide a continuous indication of PM_{10} concentrations. These data are especially useful for quantifying short term spiking emissions of fugitive dust during vehicle movement on unpaved road surfaces. In this study, four PM_{10} TEOMs were located at elevations from four to twenty two feet above the ground on the downwind side of the unpaved road. A single PM_{10} TEOM was mounted on the upwind side of the road. Wind direction and wind speed monitors were located at the 2 and 10 meter elevations on the downwind monitoring tower. All road surface and vehicle characteristics were recorded throughout the study.

2:30 pm "Development of Agricultural Dust Emission Inventories for the Central States Regional Air Planning Association," B. M. Penfold, D. C. Sullivan, S. B. Reid, and L. R. Chinkin, Sonoma Technology, Inc.

In support of the Central States Regional Air Planning Association's (CENRAP) need to develop a regional haze plan, Sonoma Technology, Inc. developed a 2002 emission inventory of particulate matter (PM) emissions from agricultural dust sources for the nine-state CENRAP region, which includes Texas, Oklahoma, Louisiana, Arkansas, Kansas, Missouri, Nebraska, Iowa, and Minnesota. Emissions from agricultural tilling operations in the CENRAP region were estimated by applying emission factors to county-specific activity data for tilling practices, which were gathered by surveys of agricultural extension offices. In addition, GIS databases were used to prepare county-level soil silt contents. Emissions from confined animal feeding operations (CAFOs) were estimated by applying constant emission factors to facility-specific animal population data from permitting data gathered for each CENRAP state. Total PM2.5 emissions from agricultural dust in the CENRAP region were estimated to be 295,000 tons per year, a figure that is approximately 20% lower than the estimates included in the 2002 preliminary National Emission Inventory (NEI). In addition, the spatial distributions of emissions differed significantly from those included in the 2002 preliminary NEI.

3:00 pm "Measurement of PM10 Emission Rates from Roadways in Las Vegas, NevadaUsing the SCAMPER Mobile Platform with Real-Time Sensors," D. R. Fitz, K. Bumiller, University of California, Riverside; V. Etyemezian, H. Kuhns, G. Nikolich, Desert Research Institute.

Based on emission factors derived from the AP-42 algorithm, particulate matter from paved roads has been estimated to be a major source of PM10 of geologic origin. This is an empirical formula based on upwind-downwind measurement of PM10 concentrations and is dependent solely on the silt loading of the pavement and the weight of vehicles. In order to accurately estimate emissions it is therefore necessary to measure the silt loadings on roadways. This is a time-consuming and often dangerous measurement. As an alternative, we measured PM10 concentrations in front of and behind a moving vehicle to estimate the emission factors for a vehicle on paved roads. This approach allows rapid emission estimates for entire roadways. Light scattering optical sensors were used to measure PM10 concentrations with a time resolution of several seconds. Sensors were mounted in the front and behind the vehicle in the well-mixed wake. A special inlet probe was designed to allow isokinetic sampling under all speed conditions. As a first approximation the emission factor was based on the concentration difference between upwind and downwind and the frontal area of the test vehicle. This method, SCAMPER (System for Continuous Aerosol Monitoring of Particulate Emissions from Roadways) was tested on a circuit in Las Vegas in a collaborative comparison study with researchers from the University of Nevada's Desert Research Institute, who also used a moving platform (TRAKER) to estimate emission rates from the roadways. The circuit was over 100 miles in length and included many roads that showed track-on from construction activities. Tests were conducted on two consecutive days and the overall repeatability was within 25%. Both techniques are useful for quickly surveying large areas and for investigating hot spots on roadways caused by greater than normal deposition of PM10 forming debris.

Wednesday, April 13, 2005

Session 7 Fugitive Dust

Chairs: Bill Kuykendal, US EPA
Russ Merle, Clark Co, NV DEQ

3:30 pm BREAK

4:00 pm "Wind Tunnel Measurement of Emission Factors from Crusted and Intentionally Disturbed Urban Soils," D. James, University of Las Vegas, R. Wacaser, K. Barber, J. Bentley, V. Chakka, University of Nevada; R. Merle, M. Uhl, R. Langston, Department of Air Quality & Environmental Management, Clark County, Nevada.

A portable 3.2-meter long wind tunnel of 0.15 m x 0.15 m cross section was used to measure PM-10 emissions from crusted and intentionally disturbed urban soils at 32 sites within the Las Vegas metropolitan area land disposal boundary in summer 2004. Simultaneous measurements of ambient PM-10 and tunnel-eroded PM-10 were made using TSI DustTrak® Model 8520 PM-10 monitors. Microbursts ("spikes") of high initial PM-10 at the initiation of each wind speed change were observed in nearly all runs, and were separated from the main signal. Onset and completion of PM-10 microbursts were determined by computing 25-point running slopes.

Results show that:
(1) significant increases in potential to emit wind-eroded PM-10 occurred after removal of naturally occurring surface crust, and
(2) Computed spike magnitudes and steady state erosion values depended on signal processing techniques.

4:30 pm "Open Path Optical Sensing of Particulate Matter," B. Kim, M. Kemme, R. Hashmonay, R. Varma, US Army Research & Development.

Fugitive particulate matter (PM) monitoring technology development is a high priority research and development topic for technology users under the US Army Environmental Quality Technology Program. Until present time, there is no scientifically reliable Federal or State standard protocol to monitor fugitive PM. In real world situations, the best method is the filter measurement in the plume at a fixed location. However, the filter measurement has many limitations and alternative PM monitoring technology development is critical.

US Army Engineer Research and Development Center (ERDC) - Construction Engineering Research Laboratory (CERL) and ARCADIS have been investigating an integrated optical remote sensing (ORS) approach for characterizing PM by measuring multi-spectral light extinction. The optical open path remote sensing instruments used in this study include monostatic Open Path-Fourier Transform Infrared (OP-FTIR) Spectrometers, Visible Spectrometer , dual-beam opacity meter (DBOM) operating at 650 nm and µm and a visible LIDAR collecting light extinction data through the controlled cloud of PM. This research focused on several PM plumes emitted in a controlled manner from a smoke generator, including fog oil and dust. An aerodynamic particle-size (APS) is used to measure size distribution directly and in real time of the PM released. Preliminary results from the LIDAR measurements indicate that fog oil has larger extinction in visible region when compared to dust, consistent to earlier results.

5:00 pm "The Use of TEOMs and Sampling Arrays to Quantify the Capture Efficiency of Fugitive Dust Emissions from Ready Mixed Concrete Loading," E. Herbert, National Ready Mixed Concrete Association, J. Richards, Air Control Techniques.

This paper summarizes the successful application of PM10 TEOMs and Method 5D-type sampling arrays to continuously monitor fugitive dust emissions from ready mixed concrete truck mix and central mix loading operations. Sixty sampling nozzles were arranged in arrays that were mounted immediately adjacent to the loading operations. The nozzles were sized to provide equal capture velocities across the entire sampling array. The combined gas streams from two separate arrays were joined and monitored using a PM10 TEOM. Wind speed and wind direction were monitored by a set of two monitoring stations located close to the arrays and by visual indicators of wind direction. The results of the test program indicate that the TEOMs combined with the sampling arrays provide an especially accurate means to quantify fugitive dust emissions and hood capture efficiencies.

Thursday April 14, 2005

Session 8 Mobile Sources

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

8:30 am "On-Road Mobile Source Emission Inventory Development for the Central States Regional Air Planning Association," D. C. Sullivan, S. B. Reid, P. S. Stiefer, T. H. Funk, L. R. Chinkin, Sonoma Technology, Inc.

In support of the Central States Regional Air Planning Association's (CENRAP) need to develop a regional haze plan, Sonoma Technology, Inc. developed a 2002 emission inventory of on-road mobile sources for the nine-state CENRAP region, which includes Texas, Oklahoma, Louisiana, Arkansas, Kansas, Missouri, Nebraska, Iowa, and Minnesota. The inventory was developed using MOBILE6 inputs and vehicle activity data acquired from state and local information sources. The data collected included vehicle miles traveled (VMT), fleet characteristics, regulatory controls, and fuels characteristics. MOBILE6 was run within the SMOKE emissions modeling system using gridded, hourly temperature data for the CENRAP region, and county-level annualized emissions were developed by averaging January and July runs. The final emission estimates for the entire CENRAP region for NOx, VOC, SO2, PM2.5, and NH3 were 0%-20% lower than those included in the 2002 preliminary National Emission Inventory (NEI), with significant differences observed at both the state and county level. In addition, analyses of the fleet characteristics data, especially vehicle age distributions derived from vehicle registration databases, revealed unexpected findings that could have substantial impacts on mobile source modeling.

9:00 am "Estimation and Effects of Vehicle Mix on On-Road Emissions Estimates," C. E. Lindhjem and S. Shepard, ENVIRON International Corporation.

Heavy-duty vehicles have been considered a large fraction of emissions from on-road vehicles, but have become of greater interest, as the light-duty emissions have been controlled to a greater extent than heavy-duty vehicles. Because a heavy-duty vehicle can produce 10 to 100 times the emissions (of NOx and PM emissions especially) of a light-duty vehicle, heavy-duty vehicle activity needs to be better understood and characterized. One of the key uncertainties with the use of MOBILE6 includes the fraction of heavy-duty vehicles on all types of roadways at all times of day. This paper describes the analysis of extensive automatic traffic recorder (ATR) data collected by State Departments of Transportation to investigate overall and temporal (hour of day, day of week, and month of year) patterns of vehicle mix by roadway type. A method is described and used to cross-reference the vehicle types identified by ATR data into MOBILE6 vehicle types and used to estimate fleet emissions. Comparisons will be provided that show the differences in the overall and temporal emissions estimates by roadway type compared with estimates using the national average fleet mix.

10:00 am BREAK

10:30 am "Development and Application of a Micro Scale Emission Factor Model (MicroFac) in Mobile Source Emissions," R. B. Singh, J. J. Sloan, University of Waterloo, CANADA.

A new micro scale emission factor model (MicroFac) for predicting real-time motor vehicle emissions (gaseous and particulate matter) has been developed. MicroFac uses a disaggregated algorithm, based on the real on-road vehicle fleet, and calculates emission rates for a real-time site-specific fleet. The model requires only a few input variables that are necessary to characterize the fleet. The main input variables required are the description or characterization of the vehicle fleet, time and day of the year, fuel type, road gradient, ambient temperature and relative humidity.

11:00 am "Development of Link-Level Mobile Source Emission Inventories," A. K. Pollack, J. Haasbeek, ENVIRON International Corporation; M. Janssen, Lake Michigan Air Directors Consortium.

Highly resolved emission inventories for on-road mobile sources are needed for air quality modeling to develop the necessary technical support for new State Implementation Plans (SIPs) for regional haze, fine particles, and ozone. Emissions for motor vehicles are estimated using vehicle miles traveled, speed, and other activity data provided by state agencies and Metropolitan Planning Organizations (MPOs) using transportation demand models (TDMs), and emission factors from EPA's MOBILE6 model. To support this modeling in the upper Midwest, ENVIRON, working with LADCO, State DOTs, and local MPOs, has developed software called T3 (TDM Transformation Tool) that takes TDM output from approximately twenty transportation networks using a variety of models, applies appropriate data transformations, and outputs the link-level activity data in a uniform format for input to the CONCEPT emissions processing model. In a parallel effort, analyses of extensive automatic traffic recorder (ATR) data collected by State DOTs were conducted to develop temporal profiles (hour of day, day of week, and month of year) of vehicle counts and vehicle mix by roadway type for developing the detailed on-road emission inventories. This paper describes the T3 software, which was developed using open source and freely available PostgreSQL and Perl programming languages. T3 works with many spatial and temporal layers of vehicle miles traveled (VMT), speed, and Traffic Analysis Zone (TAZ) starts/stops. Example link-level emission inventories generated using the T3 and CONCEPT will be shown.

Session 8 Mobile Sources

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

11:30 am "Development of Detailed Railyard Emissions to Capture Activity, Technology and Operational Changes," R. G. Ireson, Air Quality Management Consulting; M. J. Germer and L. A. Schmid, Union Pacific Railroad Company.

Railyard operations involve a variety of complex activities, including inbound and outbound train movements, classification (i.e., separating cars from inbound trains for redirection to multiple destinations, and building new trains), and servicing locomotives. Standard locomotive duty cycles provide long-term average activity patterns for locomotive operations, but they are not appropriate for the specialized activities that occur within railyards or at locations such as ports, and emissions in such areas can be high. There are significant emission rate differences between locomotive models, and differences in the types of service for which specific models are used. Data for throttle-specific emissions, activity levels, and locomotive models and operating practices can be used to provide more accurate emissions estimates for such operations. Such data are needed to quantify actual emissions changes in these high activity areas. A calculation scheme has been developed to generate detailed emission inventories based on the types of data that are collected for managing rail operations. This scheme allows improved accuracy in emissions estimation, and also provides a reliable basis for bottom-up tracking of emissions changes over time. Factors that can be addressed include: changes in the distribution of locomotive models and control technology levels (e.g., increasing fractions of Tier 0, 1, and 2 locomotives) for both line haul and local operations; actual in-yard idling duration and reductions associated with auto-start-stop technologies; fuel quality effects; and detailed operating practices for switching and train-building operations. By providing detailed disaggregation of activity and emissions data, the method also makes it possible to quantify and evaluate the effects of specific emission reduction alternatives.

12:00 pm Lunch

1:30 pm "Heavy-Duty Diesel Vehicle Emissions in Greater Vancouver," A. Ergudenler and D. Jennejohn, Greater Vancouver Regional District; W. C. Edwards, Levelton Consultants, Ltd.

Emission inventories and forecasts prepared by the Greater Vancouver Regional District (GVRD) show that motor vehicles are a significant source of air pollution in the Lower Fraser Valley (LFV) airshed and contribute to concerns of human exposure to fine particulate matter (PM2.5) and ozone. There is evidence from studies in the Lower Fraser Valley and in other jurisdictions that exposure to diesel exhaust emissions can have significant effects on human health (e.g. increased cancer risk, respiratory and cardiovascular illness and premature mortality). The GVRD and its partner agencies recognize the importance of heavy-duty vehicle emissions in the airshed, and the need to investigate the issue and manage these emissions.

The scope of this study was to (i) characterize the regional heavy-duty diesel vehicle (HDDV) fleet and develop a database relevant to determining emissions and forecasts, (ii) determine emission factors for each class of heavy-duty vehicle in the regional HDDV fleet, (iii) calculate “baseline” emissions of criteria air contaminants, toxics and greenhouse gases, (iv) estimate the spatial distribution of emissions with the intent of providing an approximation of actual emissions/concentrations on roads and near communities. According to vehicle registration statistics for 2003, there were 32,521 onroad and 1,982 nonroad heavy duty diesel vehicles operating primarily in the region. Forty per cent of the onroad HDDVs were in the Class 7 or Class 8 weight classes (Heavy-Heavy). The GVRD forecast of the year-2000 emission inventory estimated that onroad heavy duty diesel vehicles were responsible for 4.1% of the PM2.5 emitted in the Canadian portion of the Lower Fraser Valley International Airshed in 2000. The implementation of lower HDDV emission standards and ultra low sulphur diesel fuel is projected to reduce the share of regional PM2.5 emissions from these vehicles to about 2% by 2010 and 1% by 2025. The share of NOx emissions from onroad HDDVs is forecast to decrease from 14.9% in 2000 to 8.1% in 2010 and 2.4 % in 2025. HDDV exhaust emissions and EMME2/traffic data were used to predict the PM2.5 concentrations near roadways. It was estimated that the HDDVs contribute up to 4-10 µg/m3 to PM2.5 concentrations on major truck routes at a distance 20-100 m from the road.

2:00 pm "Development of Emission Inventories of Recreational Boats and Commercial Marine Vessels for the Central States Regional Air Planning Association," S. B. Reid, D. C. Sullivan, P. S. Stiefer, L. R. Chinkin, Sonoma Technology, Inc.

In support of the Central States Regional Air Planning Association’s (CENRAP) need to develop a regional haze plan, Sonoma Technology, Inc. developed a 2002 emission inventory of non-road mobile sources for the nine-state CENRAP region, which includes Texas, Oklahoma, Louisiana, Arkansas, Kansas, Missouri, Nebraska, Iowa, and Minnesota. A significant portion of project resources were devoted to estimating emissions from recreational boating activities and commercial marine vessels in this region.

Pleasure craft emission inventories were developed from bottom-up surveys of registered boat owners in each of the CENRAP states. Activity data gathered from these surveys were used to update default inputs to the EPA’s NONROAD 2004 model. Recreational boat usage in the CENRAP region was estimated to be approximately twice as large as that predicted by default inputs to the NONROAD model (even after controlling for survey response bias), and emission estimates for NOx, VOC, SO2, and PM2.5 were 2-4 times higher than those included in the 2002 preliminary National Emissions Inventory (NEI). Also, the spatial distribution of emissions was significantly improved by replacing NONROAD allocation surrogates with data developed from survey results.

Emission inventories for commercial marine vessels were developed from local activity data for gathered directly from local agencies, such as individual port operators. EPA guidance for emissions estimation techniques was followed. Emissions from commercial marine vessels in the CENRAP region were estimated to be approximately three times smaller than those included in the 2002 preliminary National Emissions Inventory (NEI). In addition, the spatial distribution of emissions was significantly improved.

Session 8 Mobile Sources

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

2:30 pm "Modeling In-Flight Aircraft Emissions," Z. Adelman, C. Seppanen, F. Binkowski, University of North Carolina, Chapel Hill.

Using the 1999 Boeing Scheduled Civil Aircraft Emissions database and a modified version of the Sparse Matrix Operator Kernel Emissions (SMOKE) model we created a system for estimating emissions from aircraft in three-dimensions. An improvement over the standard method of only representing aircraft emissions at airports in the first model layer, the system we developed under funding by the National Aeronautics and Space Administration (NASA) extends the emissions estimates vertically to 19km. Developed to study the relative effects of in-situ and boundary layer emissions sources on aerosol loading in the free-troposphere, the modified version of SMOKE uses a hybrid stationary area/stationary point source approach to spatially allocate the aircraft emissions. We converted seasonal, average-day estimates of CO, NOx, total hydrocarbons (HC), and fuel burned in the Boeing database to speciated inputs for the Community Multiscale Air Quality (CMAQ) model. Using data from the primary literature we derived particulate matter (PM) emissions factors from the fuel usage and converted the HC estimates to speciated volatile organic compounds (VOC) emissions. We also derived vertically dependent temporal profiles from data in the documentation associated with the aircraft emissions database. We will provide qualitative results of two emissions simulations using the in-flight aircraft emissions, one on a continental U.S. domain and the second on a trans-Pacific hemispheric domain.

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Thursday, April 14, 2005

Session 9 Point/Area Sources

Chairs: Roy Huntley, US EPA
Bob Betterton, West Virginia DEP

8:30 am "Compiling the 2002 Point Source NEI: Whose Data Get Priority?" S. Finn, D. Wilson, Eastern Research Group; A. Pope, US EPA

The 2002 point source National Emission Inventory (NEI) for hazardous and criteria air pollutants (HAPs and CAPs) is composed of state, local, and tribal agency NEI Input Format (NIF) submittals, and data from the U.S. Environmental Protection Agency (EPA) Emission Standards Division (ESD), Clean Air Markets Division (CAMD), and Toxic Release Inventory (TRI). The data are compiled from these multiple sources to develop as complete an inventory as possible. This means, however, that there are duplicative estimates from one or more of these sources. The first step in the process of identifying duplicative estimates from different data sources is to accurately match the facilities and assign a common facility ID. In the 2002 point source NEI, the field with this common facility ID is the NEI Facility ID. At the Site level (a facility can have multiple sites in the 2002 point source NEI), the Site ID is retained from the original data source. Once common facilities are identified, the data sources are selected based on the reported pollutants and priorities shown below:

(1) Preferred ESD and CAMD data;
(2) Tribal agency data;
(3) Local agency data;
(4) State data;
(5) Other ESD-Maximum Available Control Technology data (non-preferred); and
(6) TRI data.

This paper discusses how this data priority scheme was implemented for the 2002 point source NEI. In particular, a number of data selection passes are made for HAPs and particulate matter, because overlapping compounds could be retained if different, individual pollutant codes are reported for the same pollutant category (e.g., mercury and compounds, PM10).

9:00 am "Update PM Augmentation Procedures for the 2002 Point Source NEI," P. Fields, R. Chang, M. Wolf, Eastern Research Group; A. Pope, US EPA

Emission inventories are critical for the efforts of state, local, and tribal agencies to attain and maintain National Ambient Air Quality Standards (NAAQS) that the U.S. Environmental Protection Agency (EPA) has established for criteria air pollutants. Emission inventories are needed to develop State Implementation Plans to demonstrate compliance with the 8-hour ozone NAAQS, the particulate matter(PM)2.5 NAAQS , and the regional haze rule. The PM2.5 NAAQS and the regional haze rule focus special attention on emission inventory efforts for the multiple PM species needed in regional air quality modeling. EPA requires emission inventory submittals to the National Emission Inventory (NEI) for filterable and primary PM (PM10-FIL, PM10-PRI, PM2.5-FIL, and PM2.5-PRI), along with condensible PM (PM-CON). If state, local, and tribal agencies do not submit complete PM inventories for the 2002 point source NEI, EPA implements augmentation procedures as described in this paper. The approach used to augment the 1999 NEI was reviewed and an assessment was made of improvements needed in the 1999 approach. This paper discusses the updated, stepwise PM augmentation procedures for 2002 point sources and the data sources that form the basis for the associated 2002 NEI computer algorithms developed and applied to generate PM estimates.

9:30 am "Solvent Mass Balance - Approach for Estimating VOC Emissions from Eleven Nonpoint Solvent Source Categories," D. L. Jones, E C/R Inc.

Updated solvent usage data for the year 2002 has been developed for the EPA's Emission Inventory Group for eleven (11) area source categories that are common to many volatile organic compound (VOC) emission inventories. These categories are: Architectural Surface Coating, Automobile Refinishing, Consumer and Commercial Products, Dry Cleaning, Graphic Arts, Industrial Adhesive and Sealants, Industrial Coating Operations, Pesticide Application, Process Solvents (and other operations), Surface Cleaning (degreasing), and Traffic Paints. The methodology for developing the estimates uses a material mass balance approach that begins with national solvent production and consumption estimates for a category derived from sales and other market data, and accounts for point source contributions using facility data submitted to the EPA. National solvent utilization is allocated to states and counties using population and business activity data, as appropriate for the category. This approach to estimating solvent consumption and emissions will be used in the National Emission Inventory as the new EPA "Solvent Mass Balance" method for estimating VOC emissions from these sources. The resulting area source VOC estimates for the 11 categories represent improved emission estimates for a sizeable portion of the overall VOC inventory. This report describes the new material "Solvent Mass Balance" methodology and compares the new EPA estimates to existing 1999 NEI estimates and 2002 State submitted estimates for the solvent area source categories.

10:00 am BREAK

Session 9 Point/Area Sources

Chairs: Roy Huntley, US EPA
Bob Betterton, West Virginia DEP

10:30 am "An Abridged History and Commentary on Emission Inventories and Emission Factors and How They Became a Cornerstone of Air Quality Management and Grew in Uncertainties," J. H. Southerland, North Carolina Dept of Environment and Natural Resources.

The author of this paper will attempt to condense almost thirty eight years of experiences and observations, including over 10 years prior to the beginning of his career, into a discourse on when and why some long-lasting decisions were made, how the science and art have developed. The interfaces with other programs that have influenced these decisions will be probed and discussed. This treatise will attempt to birth a better appreciation, especially for those newly indoctrinated into the world of emission inventories as to the importance and role of emission estimations, for how they can influence the future of air pollution control and attempt to recruit them to maintain a professional career connection with the field.

Additionally, the author will provide some "crystal ball" projections into the future as relate to emission measurements, emission estimates, tracking data in real time or more nearly real time, data systems and databases expected to develop, inter-relations of data, the likely importance of emission cap and trades and other such topics of prognostication, hopefully presented in a curmudgeonly fashion.

11:00 am "Developing a Baseline Emission Inventory for the Border 2012 Program," P. G. Fields, M. E. Wolf, Eastern Research Group, R. Halvey, Western Governors' Association; C. Vineyard, US EPA, S. S. Martinez, E. Rebolledo, A. Cruzado, H. Landa, Secretaria de Medio Ambiente y Recursos Naturales; A. F. Bremauntz, V. G. Bravo, L. Roja-Bracho, A. M. Kramer, Instituto Nacional de Ecologia, MEXICO.

The Border 2012 program was established by the U.S. Environmental Protection Agency (EPA), Mexico's Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), and other U.S. and Mexican environmental agencies as a successor to the Border XXI program. Border 2012 is designed to address various environmental issues that exist in the U.S.-Mexico border region. Pursuant to the 1983 La Paz Agreement, the U.S.-Mexico border region is defined as following the border between the two countries from the Pacific Ocean to the Gulf of Mexico and extending 100 kilometers (km) into each country from both sides of the border.

A baseline emissions inventory was developed to increase the understanding of emissions sources located within the U.S.-Mexico border region, support air quality assessment for the Border 2012 program, and fulfill Interim Objective 1 of the Border 2012 Plan. The baseline emissions inventory combines existing criteria air pollutant emission inventories from the U.S. National Emissions Inventory (NEI) and the Mexico NEI using geographical information system (GIS) techniques. The baseline inventory includes VOC, CO, NOx, SO2, PM10, PM2.5, and NH3 emissions from point, area, nonroad and onroad mobile emissions for the year 1999, as well as projected emissions for the years 2002 and 2012. This paper discusses the spatial allocation techniques used to allocate county- (in the U.S.) and municipality-level (in Mexico) emissions to the 100 km border zone as well as the development of projection factors for the Mexican emissions. The results are presented in various formats, including "policy" groupings to facilitate analysis of potential control strategies and emission summaries for 14 "Sister Cities" located along the U.S.-Mexico border.

11:30 am "Phase III Mexico National Emissions Inventory: Point Sources and Future Activities," S. S. Martinez, E. Rebolledo, H. L. Fonseca, R. M. Verde, R. C. M. Martinez and A. Cruzado, Secretaria de Medio Ambiente y Recursos Naturales; V. G. Bravo; A. M. Kramer, L. Rojas-Bracho, A. F. Bremauntz, Instituto Nacional de Ecologia; P. G. Fields, M. E. Wolf, Eastern Research Group; R. Halvey, Western Governors' Association; W. Kuykendal, US EPA; P. Miller, Commission for Environmental Cooperation.

The Mexico´s National Emissions Inventory (MNEI) was developed in three phases: Phase I, covered a planning and organization program for the development of the Inventory's Preparation Plan; Phase II, included the development of the inventory in the six northern border states of Mexico: Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas; and the Phase III (currently in development), covers the rest of the country, 26 states. The MNEI includes emission estimates for seven pollutants (VOC, CO, NOx, SO2, PM10, PM2.5, and NH3) for point, area, on-road mobile, nonroad, and natural sources.

This paper focuses on the development and conclusion of the Phase III for point sources for the MNEI. The information of point sources emissions was collected, compiled, processed and to some extent estimated by State environmental agencies, the Ministry of Natural Resources and the Environment of Mexico (Secretaría de Medio Ambiente y Recursos Naturales, SEMARNAT) and the National Institute of Ecology (Instituto Nacional de Ecología, INE). The point sources were classified according to regulation in federal and state sources. The information of point sources emissions was obtained from both combustion and processing data. Four regional workshops took place throughout the country, with the participation of the State environmental agencies and the Delegations of SEMARNAT, with the objective of developing sufficient capacity to collect, compile, process and estimate emissions for point sources for this phase of the MNEI, as well as quality control and assurance.

Future activities of the MNEI regarding point sources include improvement and data exploitation. Further it is envisaged that institutional capacity will be developed at the State level, in order to create a national system of emissions, a database that would include emissions from criteria pollutants, information from the public registry and pollutant transfer and greenhouse gas.

The MNEI represents a significant effort of diverse public and private entities in Mexico, U.S. and Canada. The performance of the first national emissions inventory for Mexico will be finished in April of 2005. The results will be available further in the National Emissions Inventory Format (NIF) for air quality modeling use.

Session 9 Point/Area Sources

Chairs: Roy Huntley, US EPA
Bob Betterton, West Virginia DEP

1:30 pm "Emission-Inventory Oriented Residential Wood Combustion Survey," C. Y. Wu, Minnesota Pollution Control Agency; R. Piva, US Department of Agriculture; D. R. Broderick, J. E. Houck, OMNI Consulting Services, Inc; J. Crouch, Hearth, Patio & Barbecue Association.

Residential wood combustion emits a variety of pollutants, contributing significantly to air pollution in many areas of the country. Although many local, state, provincial, regional and, federal surveys of residential wood combustion were conducted in the U.S. and Canada, only a few of these surveys provided information applicable for the improvement of emission inventories. Most surveys appeared to be conducted primarily for reasons other than for emission inventory improvement (e.g., natural resource utilization, local ordinance compliance evaluation, opinion polls, GIS-based modeling, energy consumption studies, etc.). Many nonstandard terms and variability in both appliance types and fuels resulted in considerable misunderstanding on the part of the survey respondents, survey staff, hearth product industry personnel, air quality regulators and emission inventory specialists due to the confusion over terminology.

This paper describes and analyzes the results from a recent residential wood combustion survey conducted in Minnesota for the 2002 emission inventory. The analysis shows an overall reduction of total amount of wood burned by residents from previous years. Because different wood burning appliances have different emission factors, this paper also provides population and activity levels for each major category of wood burning appliances. Results indicate that 91.15% of wood by weight was burned in non-EPA-certified appliances; 6.86% in certified, non-catalytic appliances; and 1.99% in certified, catalytic appliances. This bottom-up information could be useful for other states in compilation of emission inventories for residential wood combustion.

2:00 pm "Review of Residential Wood Combustion (RWC) Activity Level Data for Mid-Atlantic and New England States," D. R. Broderick, J. E. Houck, OMNI Consulting Services, Inc.; J. Goldman, J. Crouch, Hearth Patio & Barbecue Association.

Several sources of data have been published on residential wood combustion activity levels for Mid-Atlantic and New England states. This review was conducted to provide activity levels based on multiple sources of data. Due to the complimentary nature of the data obtained from the various data sources, a better assessment can be obtained by considering all of the data rather than any one data source alone.

Data was obtained from the Mid-Atlantic Regional Air Management Association (MARAMA) for the Mid-Atlantic/Northeast Visibility Union (MANE-VU), 2004, Energy Information Administration 2001 data, the EPA's 2002 National Emissions Inventory, Simmons Research Marketing 2002-2003 data, American Housing Survey for the United States:2001, Report on the 1995 Delaware Fuelwood Survey, May 1995, Residential Fuelwood Use in Maine, Results of 1998/1999 Fuelwood Survey, November 1999 and the Vermont Residential Fuel Wood Assessment for 1997-1998, December 2000.

RWC activity data presented here are in dry tons of cordwood or pellets used in each of the typical RWC appliance categories. These are fireplaces, conventional un-certified woodstoves, EPA certified woodstoves, pellet stoves and wood furnace/boilers. Additionally, the activity levels of manufactured firelogs are presented as they are widely used in fireplaces and often overlooked

2:30 pm "Particulate Emissions from Coal Fired Boilers," R. Andracsek and D. Gaige, Burns & McDonnell Engineering Co.

It has been demonstrated that coal fired boilers have emissions of both filterable and condensable particulate. Currently, there is not consistency between states regarding the test method required to measure particulate resulting from coal fired boilers. EPA Test Method 5 does not measure condensable particulate and EPA Test Method 202 can create pseudo particulate that bias the test results. Some recently permitted units have established particulate emission rates lower than the current (AP-42) emission factor for condensable particulate. Because of the different sampling methods, and the significant quantity of condensable emissions, the emission factor must identify the sampling method to allow comparison to other units. Permit limits used to estimate emissions must include an identification of whether or not condensable emissions are included in the compliance demonstration. If the compliance demonstration requires Method 5 only, an adjustment must be made to account for the condensable particulate. If the compliance demonstration requires Method 202, an adjustment must be included to account for the pseudo particulate.

In this paper, we present:

- a summary of recently established permit limits for particulate emissions, and the associated test method.
- a summary of published test results indicating the ratio between filterable and condensable particulate.
- a summary of the existing literature indicating the influence of pseudo-particulate matter in method 202.
- a suggested methodology to estimate filterable and actual condensable particulate, and
- a suggested focus for additional research.

3:00 pm BREAK

Session 9 Point/Area Sources

Chairs: Roy Huntley, US EPA
Bob Betterton, West Virginia DEP

3:30 pm "Developing Southern Company Emissions and Flue Gas Characteristics for VISTAS Regional Haze Modeling," N. Kandasamy, F. Ellis, J. Jansen, Southern Company Services, Inc.

Developing emissions inventories is an important step towards using regional scale atmospheric models in regulatory air quality management. The ability for atmospheric models to simulate observed air quality depends heavily on accurate spatial and temporal representation of emission source sectors such as point, area, non-road and on-road. Confidence in the relative response of the atmospheric model to emission changes is increased if methodologies used to generate typical year and future year emissions are consistent within individual source sectors. This paper summarizes the methodology used by Southern Company to develop unit level, hourly emissions and flue gas characteristics for its entire fleet of Electric Generating Units (EGU's) as input to the regional haze model (CMAQ) used by Visibility Improvement State and Tribal Association of Southeast (VISTAS). Emissions of sulfur dioxide (S02), oxides of nitrogen (NOX), carbon monoxide (CO), volatile organic compounds (VOC's) and total filterable particulate matter (PM-FIL) were developed for Base Year 2002, Typical Year 2002, and Future Years 2009 and 2018. Hour specific flue gas flow rate and temperature were also calculated for these scenarios.

4:00 pm "Development of a Fireplace Baseline Particulate Emission Factor Database," D. R. Broderick, J. E. Houck, OMNI Consulting Services, Inc; J. Crouch, Hearth Patio & Barbecue Association.

A review was conducted of all obtainable fireplace particulate emissions test reports and publications in order to develop a fireplace particulate emissions database. This project was done to provide baseline emissions levels to an ASTM committee charged with developing an emissions test method for factory built fireplaces. These data also provide improved information for emissions inventory development as compared to AP-42 emission factors. The AP-42 fireplace particulate emission factor is based on only four studies. Two were conducted in the 1970s and two in the early 1990s. There were only three factory built fireplaces tested in these four studies. Now, factory built fireplaces represent the majority of fireplaces in U.S. homes. Additionally, 24 of the 55 tests included in these four studies were from the 1990 study, which had higher values than typically reported in the other studies, due in part to the test method utilized.

The database developed and reported here was based on approximately 30 studies representing 360 test runs. The resulting database shows that the AP-42 values are approximately 15% high. With millions of fireplaces in the U.S. this would have a significant effect on emission inventories. To provide additional insight the data is presented as fireplace emissions by masonry and factory built fireplaces, tests run with cordwood and dimensional lumber and by doors open and doors closed.

4:30 pm "A Detailed Survey on Wood Use for Domestic Heating in Lombardy: Implication for PM Emission Inventory," L. Marazzi, G. M. Crovetto, A. B. Denti, M. Lapi, Lombardy Foundation for the Environment; S. Caserini, A. Fraccaroli, G. Fossati, ARPA Lombardia; G. L. Gurrieri, Regione Lombardia, ITALY.

Given the lack of reliable data on wood combustion for residential heating in Lombardy, a highly industrialized and populated area in the north of Italy, a specific study has been undertaken in the framework of "Kyoto Project", a research on climate change and control of greenhouse gases promoted by Lombardy Foundation for the Environment.

98,000 students of 386 different schools were contacted; almost 33,000 students (and their families) of 236 different schools filled a questionnaire concerning quantity and quality of wood use, as well as type of combustion installation and temporal split of wood use. Data were statistically analyzed in order to produce an estimate of wood consumption and of emissions of the main pollutants caused by combustion in fireplaces and stoves -PM10, PM2.5, PCDD/Fs- through the use of the emission factors available in literature. The results allow to define entity and patterns of domestic use of wood for domestic heating in Lombardy, and highlight the large use of wood for domestic heating, in particular in the sub-alpine area. This work confirms previous information available at the national scale on the importance of non-invoiced and self-supplying wood amount.

Wood combustion from residential fireplaces and stoves represents a substantial share of primary PM10 emissions in Lombardy (more than 20% on yearly basis, more than 30% in the winter period); the split of wood use in the eleven Provinces of Lombardy highlights the importance of a precise knowledge in the inventory of domestic wood combustion, responsible for more than 90% of the primary emitted fine particulate from non-industrial combustion in all the Province except the Provinces of Milan. The large variability of PM emission factors for wood combustion (depending on type of wood, installation, etc.) is furthermore an important source of uncertainty for PM emissions. The survey highlights the importance of information on the installation used for wood combustion and the consequences on emission uncertainty.

Thursday April 14, 2005

Session 10 Air Toxics Sources

Chairs: Anne Pope, US EPA
Andy Alexis, CA Air Resources Board

8:30 am "A Methodology to Validate the 2002 Air Toxics Inventory for Tennessee," E. Vllasi, L. Diaz, J. Yun, University of Tennessee.

The purpose of this paper is to present a methodology that is used by the State of Tennessee in generating and validating the air toxics inventory by utilizing the 1999 air toxics inventory that EPA has created, as a foundation. EPA's 1999 HAP point source inventory for Tennessee has proven to contain a multitude of errors in terms of incorporating companies without addresses, containing multiple names for one company, referring to data from as early as 1990, and for generating non-uniform Emission Units, Emission Release Points and Process IDs, etc. The presence of so much discontinuity between the data, especially when there are multiple sources of information for the same company, will only confuse the companies and will prevent any positive feedback from them. Our agenda is to create a more uniform inventory by eliminating companies that were not operational in 2002 by checking the status of companies with the Tennessee Secretary of State; apply the AFS NED ID system in generating County FIPS for all of the companies; delete Site FIPS that contain the state and county code; correct the coordinates that are wrong by calculating the new coordinates based on facility location; and populate the database with as much data as it is available (e.g. annual average operation, horizontal coordinates, actual throughput). The generated and validated database will be forwarded to companies for their review and input in updating the database, before it is finalized. Furthermore, there has been some confusion in terms of calculating emissions for Mobile sources. Whereas the Model takes into account the 28 vehicle categories, NIF Version 3 only allows emissions for 12 vehicle classes. In terms of generating Area Source inventory, for Open Burning, EPA underestimates emissions in certain counties in Tennessee by as much as 60 times.

9:00 am "Development of Air Toxics Emission Inventories for Airports: Accounting for Composition of Jet Engine Exhaust." S. Hayes, D. Daugherty, A. Pollack, D. Soften, ENVIRON International Corporation.

Increasingly, inventories of emissions from commercial airport operations are being developed to include a range of potentially toxic air compounds. This paper considers the development of such air toxics emission inventories, identifying the typical sources of such emissions and their relative importance. Exhaust from jet aircraft engines on passenger and cargo aircraft can be an important source of air toxic emissions. The paper identifies, analyzes, and compares a large body of jet engine testing data now available, from which a composite speciation profile is developed that incorporates relevant engine test data and recognizes the effects of historical trends in engine design and material composition on exhaust emissions and composition. The composite speciation profile is compared with standardized historical profiles.

9:30 am "Projection of Hazardous Air Pollutant Emissions to Future Years," M. Strum, A. Pope, T. Palma, S. Shed, US EPA; R. Mason, National Oceanic and Atmospheric Administration; R. Cook, US EPA; J. Thurman and D. Ensley, Computer Sciences Corporation.

Projecting a hazardous air pollutant (HAP) emission inventory to future years can provide valuable information for air quality management activities such as prediction of program successes and helping to assess future priorities. We have projected the 1999 National Emission Inventory for HAPs to numerous future years up to 2020 using the following tools and data:

- the Emission Modeling System for Hazardous Air Pollutants (EMS-HAP)
- the National Mobile Inventory Model (NMIM)
- emission reduction information resulting from national standards and economic growth data

This paper discusses these projection tools, the underlying data, limitations and the results. The results presented include total HAP emissions (sum of pollutants) and toxicity weighted HAP emissions for cancer and respiratory noncancer effects. We show these projections, along with historical emission trends. The data show that stationary source programs under section 112 of the Clean Air Act Amendments of 1990 and mobile source programs which reduce hydrocarbon and particulate matter emissions, as well as toxic emission performance standards for reformulated gasoline, have contributed to and are expected to continue to contribute to large declines in air toxics emissions, in spite of economic and population growth. We have also analyzed the particular HAPs that dominate the various source sectors to better understand the historical and future year trends and the differences across categories.

10:00 am BREAK

Thursday April 14, 2005

Session 11 Emission Inventory Preparation for Modeling

Chairs: Madeleine Strum, US EPA
Michael Jay, US EPA

10:30 am "CONCEPT - Consolidated Community Emissions Processing Tool - An Open Source Tool for the Emissions Modeling Community," C. Loomis, J. G. Wilkinson, Alpine Geophysics; J. Haasbeek, A. Pollack, ENVIRON Corporation; M. Janssen, LADCO.

The new CONCEPT (CONsolidated Community Emissions Processing Tool) Emissions Processor is now available for use by the emissions modeling community. Developed as joint project between Alpine Geophysics, LLC and ENVIRON Corporation, with Midwest RPO and joint RPO funding, the CONCEPT model combines the best attributes of current emissions modeling systems into an open source model highlighting the following features:

1) Open Source. Written primarily in Postgres SQL, the software required for running CONCEPT is public domain. The model itself is GNU Public License (GPL) compliant and users are encouraged to make additions and enhancements to the modeling system.

2) Transparent. The database structure of the model makes the system easy to understand, and the modeling codes themselves are extremely well documented to encourage user participation in customizing the system for specific modeling requirements.

3) Quality Control. The CONCEPT model structure and implementation allows for multiple levels of QA analysis during every step of the emissions calculation process. Using the database structures, an emissions modeler can easily trace a process or facility and review the calculation procedures and assumptions for any emissions value.

The CONCEPT model includes modules for the major emissions source categories: area, point, motor vehicle and biogenics, as well as a number of supporting modules, including non-road emissions development, spatial allocation factor development, growth and control for point and area, and CEM point source emissions handling. The emissions modeling community has already begun development of additional CONCEPT support modules including CEM preprocessing software, graphical QA tools, and an interface to the traffic demand models for on-road motor vehicle emissions estimation.

This paper describes the features and improvements incorporated into each section of the CONCEPT system, including a comparison and evaluation with other current modeling systems. We will identify the advantages of the CONCEPT modeling approach, and discuss areas of potential improvement. Finally, we discuss the plans and paths for additional CONCEPT development.

11:00 am "Everything That Emission Factors/Emission Inventories Could Be," K. Baugues, KERAMIDA Environmental, Inc.

This paper addresses areas where emission factors/emission inventories could be improved based on over 30 years of working with emission inventories. The areas of improvement depend upon the ultimate use of the information. Areas discussed will include air permitting, national inventory development and air quality modeling. Individual areas of improvement will include better methods of determining emission factors, quality assurance of parameters needed for dispersion modeling and use of consistent methodologies for emission estimation.

The primary focus will be on improving emission inventories for use in air quality dispersion modeling analyses. Specific issues addressed will include: spatial and temporal resolution of emissions, linearity of gas exit velocity and exit gas temperature with process rate, estimation of allowable emissions, development of inventories for Prevention of Significant Deterioration (PSD) increment consumption analyses and for National Ambient Air Quality Standards (NAAQS) modeling analyses

The purpose of this paper is to outline areas where improvements could be made in emission factors or emission inventories in order to provide better tools for managing air quality.

11:30 am "Development of Hourly Inventories Utilizing CEM-Based Data," G. Stella, Alpine Geophysics.

Recent improvements in emissions recording, reporting and modeling have allowed for analysis of some emission source types at an hourly level of temporal resolution. Continuous emissions monitoring (CEM) is the continuous measurement of pollutants emitted into the atmosphere in exhaust gases from combustion or industrial processes. The U.S. Environmental Protection Agency has established requirements for the continuous monitoring of SO2, volumetric flow, NOx, diluent gas, and opacity for units regulated under the Acid Rain Program. The CEM rule also contains requirements for equipment performance specifications, certification procedures, and record keeping and reporting. These recorded data can be used both directly and indirectly to allocate emissions to specific episodes of time during the emissions processing of inventories for air quality modeling analyses.

The purpose of this paper is to describe the development of a set of hourly emission files and associated temporal allocation factors used in modeling ozone and PM precursor power sector (EGU) emission inventories for national, annual episodes. We will include a discussion of the issues encountered in preparing the factors and cross-reference data and the generation of these files using raw CEM data in the VISTAS regional planning organization domain and present comparisons with inventories using pre-CEM based factors.

Session 11 Emission Inventory Preparation for Modeling

Chairs: Madeleine Strum, US EPA
Michael Jay, US EPA

1:30 pm "Emissions Modeling in Action: Suggestions to Improve the Process of Developing Emissions Estimates for Use in Air Quality Modeling Studies," D. R. Soften, C. Emery, ENVIRON International Corporation; J. G. Wilkinson, C. F. Loomis, Alpine Geophysics.

It is well understood that emissions estimates are a critical component to the air quality modeling process. However, even after nearly four decades, developing adequate emissions estimates for use in air quality modeling studies continues to be a difficult task. That is, though significant resources have been devoted to better understand and manage emissions data and estimates over the past four decades, the validity of emissions estimates that result from the emissions modeling process continues to be an issue for debate.

Many of the shortcomings that exist in the efforts to develop emissions estimates were highlighted in an ongoing study including emissions estimates, meteorological modeling, and photochemical modeling of air quality in the San Francisco Bay Area (and also including much of the San Joaquin Valley region, Sacramento region, and South Central Coastal portions of the state) for ozone episodes occurring in July 1999 and July-August 2000. Though these problem areas are not necessarily new or unique to the Bay Area Air Quality Modeling Study, they continue to be a burden on the efforts to efficiently perform the activities necessary to complete such a study. For example, significant wildfire emissions occurred during the July-August 2000 episode for which specific emissions models were applied to estimate the emissions; however, it was shown to be impossible to verify the magnitudes of the estimates. Estimating on-road mobile source emissions proved to be just as difficult given that the process to estimate these emissions appeared to be driven as much by policy factors (e.g., conformity budgets) as it was driven by scientific and technical factors. Further, special research studies carried out by University of California researchers indicated potentially significant mis-estimates of ozone precursors. In addition, difficulties were encountered in simply knowing the specific version of the emissions data or estimate that was used.

The emissions modeling process that was followed to estimate emissions for the Bay Area Air Quality Modeling Study is described. Problems that occurred in this effort are discussed, and specific recommendations to mitigate the issues are described. Further, where possible, specific local, state, and federal activities or policies that attempt to address the problems are identified. Finally, the need to address uncertainties in emissions estimates vis-à-vis their impacts on air quality modeling results is discussed.

2:00 pm "Transparent, Comprehensive, and Ready for Modeling - Building Regional Inventories in the 21st Century," M. Janssen, Midwest Regional Planning Organization.

This paper will explore how the regional modeling and SIP inventories developed by the Regional Planning Organizations(RPOs) differ from other inventories in their scope, complexity, and flexibility. The paper will juxtapose the RPO and EPA's NEI inventories and explain why their goals and priorities differ so much. The paper will explore how Midwest RPO prioritized it's inventory development projects and how the changing face of emissions inventories and emissions modeling effects these projects. Much of the paper will summarize the individual project goals and outcomes. Finally, the paper will synthesize a direction states, tribes, FLMs and RPO can take for future inventory development.

2:30 pm "Inter-annual and Seasonal Variability of Meteorologically Influenced Emissions," W. G. Benjey, E. Cooter, National Oceanic and Atmospheric Administration.

U.S. Environmental Protection Agency (EPA) is conducting a Global Change Research Program (GCRP) in support of the U.S. Global Change Research Program. The air quality portion of the GCRP addresses the effect on air quality attributable to climate change in the intermediate future (e.g., 2050). The air quality study is divided into two phases. The first phase examines the change in air quality with respect to climate change from 2000 to 2050, using static emissions for 2001, except for biogenic and mobile source emissions which vary directly with meteorology. The second phase will examine change in air quality by 2050 reflecting both climate change and different growth and technology emission scenarios. In both cases at least five years of modeled meteorology data will be used to define the climate of 2000 and 2050, respectively. This paper will examine the inter-annual and inter-seasonal variability of emissions over the five year base study period (1999-2003). Emission data for 2001 will be used for all five years. Consequently, variability in biogenic and mobile emissions will reflect meteorological changes. In addition, some near-term changes (within ten years) in emissions caused by expected regulatory limitations will be examined to determine their magnitude relative to emission changes from meteorological variability. This information may provide further information on the amount of emission changes necessary to provide a signal in climate change beyond background meteorological variability.

3:00 pm BREAK

Session 11 Emission Inventory Preparation for Modeling

Chairs: Madeleine Strum, US EPA
Michael Jay, US EPA

3:30 pm "New Upgrades to EPA's SPECIATE Database," Y. Hsu, S. M. Roe, F. Divita, D. Holoman, E. H. Pechan & Associates, Inc.

The purpose of this project being conducted by E.H. Pechan & Associates, Inc. (Pechan) for EPA is to update the SPECIATE database. Speciation profiles in the latest SPECIATE 3.2 system have not been updated since 1999. Many of the profiles in SPECIATE 3.2 are outdated and are the result of testing and/or studies that were conducted in the 1980s and in some cases the 1970s. There are a great deal of new particulate matter (PM), volatile organic compounds (VOC), and total organic gases (TOG, which include non-VOCs) speciation data available from research studies and air quality management agency surveys.

Pechan is incorporating speciation data from 1,263 PM and 406 VOC and TOG data sources into the new SPECIATE database. In addition, many other speciated datasets were collected. These data are being evaluated and included in the next phase of this project based on their usefulness to SPECIATE users.

Under this project, Pechan has reviewed speciation data and profiles from EPA, the California Air Resources Board (CARB), Desert Research Institute (DRI), the Texas Commission on Environmental Quality (TCEQ), and numerous peer-reviewed journals for inclusion in the new SPECIATE database. EPA has conducted 155 gasoline and diesel liquid and headspace vapor profiles. Other EPA VOC, TOG and PM data incorporated into the database include the burning of foliar fuels, agricultural biomass burning, motor vehicles exhaust, pulp and paper boilers, small internal combustion engines, and iron and steel manufacturing facilities. CARB profiles are strong in area source TOG profiles (e.g. consumer products, aerosol coatings, architectural coatings, vehicle hot soak, and other motor vehicle sources powered by new reformulated gasoline). DRI has many area and point source PM speciation profiles as the result of recent studies conducted in several states. TCEQ has thousands of point source VOC profiles as a result of the 2000 Texas Air Quality Study. Finally, the literature has provided valuable sources of speciation data.

4:00 pm "Generating Sophisticated Spatial Surrogates Using the MIMS Spatial Allocator," A. M. Eyth, University of North Carolina, Chapel Hill; W. Benjey, National Oceanic and Atmospheric Administration.

The Multimedia Integrated Modeling System (MIMS) Spatial Allocator is an open source software tool for generating spatial surrogates for emission modeling, changing the map projection of shapefiles, and performing other types of spatial allocation without requiring users to have a Geographic Information System (GIS). The December 2003 version of the Spatial Allocator was able to generate basic point, line, and polygon based surrogates for modeling grids from data contained in Shapefiles. The Spatial Allocator has recently been enhanced so that it can more closely reproduce the more than sixty surrogates that are currently being used for air quality modeling applications at EPA. Several new features were required to support the more sophisticated surrogates in use today. First, where previously the Spatial Allocator created surrogates from all shapes in the input Shapefile, now the user may specify a subset of the shapes to include in the surrogate based on their attribute values. For example, this new feature allows a surrogate for urban interstates to be generated from a Shapefile that contains many road types. Another new feature is support for the generation of surrogates based on a function of multiple attributes in one or more Shapefiles. This is to support the generation of surrogates such as the “light and high tech industrial” surrogate, which is based on the sum of the light and high tech industrial square footage in each census tract; and the “housing change and population” surrogate, which is based on equal weightings of the positive change in gridded housing from 1990 to 2000 and the population in 2000 surrogates. These updates will be available in the winter of 2005. The Spatial Allocator will also be updated to create the inputs for biogenic processing that are required by the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system. Prior to that, the tool will be split into two programs: one for creating surrogates, and one for more general spatial allocation tasks. The general spatial allocator will support functions such as mapping gridded data to and from county level data, mapping from grid to grid, and aggregating data from census tract to county levels. It will also be able to print the attributes of the points, lines, or polygons that are overlapped by a grid, bounding box, or set of polygons.

4:30 pm “EPA’s new Emissions Modeling Framework,” M. Houyoux, G. Pouliot, N. Possiel, M. Strum, US EPA; W. Benjey, R. Mason, NOAA; A. Eyth, D. Loughlin, C. Seppanen,

The Office of Air Quality Planning and Standards (OAQPS) is building a new Emissions Modeling Framework (EMF) that will solve many of the long-standing difficulties of emissions modeling. The goals of the Framework are to (1) prevent bottlenecks and errors caused by emissions modeling activities, (2) develop software infrastructure for performing emissions modeling in a consistent way across multiple projects, sharing emissions data in a multi-user environment, and providing transparency to emissions modeling, and (3) document and implement best-practice approaches for emissions modeling in support of criteria, particulate, toxics, and one-atmosphere air quality modeling. The EMF will link inventory databases such as EPA’s National Emissions Inventory (NEI) with databases for emissions modeling inputs, growth data and control data. These databases will include extensive metadata and will be connected to data tracking tools, advanced quality control (QC) tools with systematic QC procedures, computational modules based on the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system, and user interfaces for setup, application, quality assurance, and tracking of emissions modeling activities and data. In addition to supporting preparation of inventories for air quality modeling, the EMF will give non-modelers access to inventory post-processing functions such as speciation, growth, and control, which is often needed for policy development and other data analysis. This paper will present the full scope of the EMF, a preview of the system, examples of benefits to the modeling community, and the plans and timetable for development and releases of the software.

Thursday April 14, 2005

Session 12 Managed Burning and Wildland Fires

Chairs: Tom Pace, US EPA
Tom Moore, WRAP

3:30 pm "The Inter-RPO Wildfire Emission Inventory for 2002 - Building a Consistent National Wildfire Emissions Inventory for Use in Regional Haze Modeling," D. Randall, J. Scarborough, Air Sciences, Inc; B. Battye, K. Boyer, EC/R, Inc.

4:00 pm "Using Satellite-Based Products to Enhance Existing Area Burned Data," A. Soja, J. Al-Saadi, B. Pierce, J. Szykman (U.S. EPA), NASA Langley Research Center; D. J. Williams, T. Pace, and J. Kordzi, US EPA; W. R. Barnard, MACTEC Engineering and Cunsulting, Inc.

Biomass burning is a major contributor of particulate matter and regional haze, particularly on the 25 worst air quality days. It is essential to monitor and accurately quantify fire emissions in an effort to attain the National Ambient Air Quality Standards (NAAQS). Currently, the United States does not have a standard methodology to track fire occurrence or area burned, which are necessary components to estimating fire emissions. One problem is the ownership and management of the land belongs to multiple organizations (i.e. USDA Forest Service, Bureau of Land Management) and private individuals, so there is not one organization that is responsible for thoroughly monitoring fire. Satellite imagery provides the opportunity to remotely sense fire across boundaries within the United States. The purpose of our presentation is to describe the available satellite-based fire data and the ability of satellite-based products to accurately define fire and area burned. We have compared Moderate Resolution Imaging Spectroradiometer (MODIS) thermal anomaly data and Geostationary Operational Environmental Satellite (GOES) Automated Biomass Burning Algorithm (ABBA) data to ground-based data from the southeast and northwest United States. Also, we have derived a cumulative fire database using both the MODIS and GOES data products.

4:00 pm "Wildfire Emission Modeling: Integrating BlueSky and SMOKE," G. Pouliot, T. Pierce, W. Benjey, National Oceanic and Atmospheric Administration; S. M. O'Neill, S. A. Ferguson, US Department of Agriculture, Forest Service.

The EPA uses chemical transport models to simulate historic meteorological episodes for developing air quality management strategies. Wildland fire emissions need to be characterized accurately to achieve these air quality management goals. The temporal and spatial estimates of emissions from fires, both wild and prescribed, have been problematic primarily because of uncertainty in the size and location of sources, and their temporal and spatial variability. Therefore, methods to estimate wildfire emissions that characterize their temporal and spatial variability are needed. To this end, the USFS (US Forest Service) and the EPA have signed an interagency agreement to improve the episodic modeling of fires with improved fuel loading data, fire location information, and fire behavior modeling (including plume behavior), using meteorological inputs. The USFS has developed a tool known as BlueSky to predict cumulative impacts of smoke from forest, agricultural, and range fires. The BlueSky modeling framework combines state of the art emissions, meteorology, and dispersion models to generate the best possible predictions of smoke impacts across the landscape. The SMOKE (Sparse Matrix Operator Kernel Emission) modeling system is a tool that creates gridded, speciated, and temporally allocated emission estimates for use in chemical transport models. The combination of these tools will include an accurate characterization of fuel loading, temporal and spatial distribution of fire emissions, and a more accurate representation of fire plumes. By combining these two tools, we will enhance our ability to simulate the impact of wild fires on air quality and develop air quality management strategies. We will show our results to date in combining these two tools and show results from air quality modeling simulations.

5:30 pm "Inter-RPO Wildfire Emission Inventory for 2002 - Building a Consistent National Emissions Inventory for Use in Regional Haze Moeling, " D. Randall, J. Scarborough, Air Sciences, Inc.; B. Battye, K. Boyer, EC/R, Inc.

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