2012 International Emission Inventory Conference

"Emission Inventories – Meeting the Challenges Posed by Emerging Global, National, Regional and Local Air Quality Issues"

Training August 13, 2012
Conference August 14 - 16, 2012
Tampa, Florida – Hyatt Regency

EPA

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

Welcome to the 2012 Emissions Inventory Conference

The US Environmental Protection Agency (US EPA) looks forward to your participation in the 2012 Annual Emissions Inventory Conference in Tampa, Florida August 13 – 16, 2012. This year's Conference focuses on how emission inventories meet the challenges posed by emerging global, national, regional and local air quality issues. This theme highlights issues such as:

- How can the emissions in these sectors improve?
- How inventories can be used to assess the impacts of transport on local NAAQS and other air quality issues;
- How inventories need to be adapted to support emerging climate issues (including multi-pollutant strategies for air quality vs climate benefits issues);
- How the NEI and other emission inventory collection efforts can benefit by looking to special studies and other active on-going research in the areas of focus for this conference;
- Which sectors in the inventory are the most difficult to characterize in a given area facing air quality and climate issues?

Training courses on different aspects of inventory use and preparation will be on Monday August 13, 2012. This year, in addition to usual courses on mobile source emissions (MOVES) and the Emissions Inventory System (EIS), we will also be offering training on EPA's Control Strategy Tool (CoST) and on the use of SMARTFIRE2 (SFv2) for wild land fire emissions. After the training day on Monday, the general Conference will open with a Plenary Session for all Conference attendees on the morning of Tuesday August 14, 2012. The plenary will include a welcome by the US EPA and local hosts, and a report from the US EPA Emissions Inventory and Analysis Group followed by a panel of speakers.

On Tuesday evening, we will have a Poster Session and Exhibitor Reception from 6:00 pm – 8:00 pm. Attending the reception is a great way to connect with other conference attendees and to discuss your air quality program needs with several exhibitors. We have a very interesting lineup of poster presentations and the authors will be available to explain their work and answer your questions.

This is a great opportunity to keep abreast of developments in the world of emissions data and to share your experiences with other emission inventory professionals from federal/state/local and international regulatory agencies, tribal governments, industry and academia. We think you will also enjoy being in Tampa and look forward to seeing you at the Conference.

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

Schedule at a Glance

Date/Time	Session	Room
Mon Aug 13		
8:30 - 12:00	Emissions Inventory System (EIS)	Regency Ballroom #3
8:30 -12:00	An Introduction to using MOVES at the National and County Levels	Regency Ballroom #5
8:30 - 12:00	Control Strategy Tool (CoST) for States/Local/Tribes	Regency Ballroom #6
8:30 - 12:00	Utilizing Local Fire Information to Develop an NEI for Fires through SmartFire 2	Regency Ballroom #7
12:00 - 1:00	**Lunch (On Your Own)**	
1:00 - 5:00	Emissions Inventory System (EIS)	Regency Ballroom #3
1:00 - 5:00	An Introduction to using MOVES at the National and County Levels	Regency Ballroom #5
1:00 - 5:00	Control Strategy Tool (CoST) for States/Local/Tribes	Regency Ballroom #6
1:00 - 5:00	US Greenhouse Gas Emissions Inventory and Greenhouse Gas Reporting Program Data Publication Tool	Regency Ball roon#7
Tues Aug 14		
8:30 - 10:00 10:00 - 10:30 10:30 - 12:00	Plenary **BREAK** Plenary	Regency Ballroom #2
12:00 - 1:00	**Lunch (On Your Own)**	
1:00 - 2:40	Session 1 - EI Preparation for Modeling	Regency Ballroom #2
	Session 2 - Biomass Burning	Regency Ballroom #5
	Session 3 - Greenhouse Gases	Regency Ballroom #7
2:40 - 3:10	**BREAK**	
3:10 - 4:50	Session 1 - Continues	Regency Ballroom #2
	Session 2 - Continues	Regency Ballroom #5
	Session 3 - Continues	Regency Ballroom #7
6:00 - 8:00	Poster Session and Exhibitors' Reception	Regency Ballroom #1
Wed Aug 15		
8:30 - 10:10	Session 4 - Tools - Leveraging Technology for Improvement	Regency Ballroom #2
	Session 5 - Stationary/Nonpoint/Area Sources	Regency Ballroom #5
	Session 6 - Oil & Gas Exploration & Production	Regency Ballroom #7
10:10 - 10:40	**BREAK**	
10:40 - 11:55	Session 4 - Continues	Regency Ballroom #2
	Session 5 - Continues	Regency Ballroom #5
	Session 6 - Continues	Regency Ballroom #7
12:00 - 1:00	**Lunch (On Your Own)**	
1:00 - 2:40	Session 7 - GIS/Innovative Methods/Remote Sensing	Regency Ballroom #2
	Session 8 - Mobile Sources	Regency Ballroom #5
	Session 9 - Global/ International Issues	Regency Ballroom #7
2:40 - 3:10	**BREAK**	
3:10- 4:50	Session 7 - Continues	Regency Ballroom #2
	Session 8 - Continues	Regency Ballroom #5
	Session 9 - Continues	Regency Ballroom #7
6:00 - 8:00	**US EPA HQ/RO Meeting**	Regency Ballroom #3

Schedule at a Glance (continue)

Date/Time	**Session**	**Room**
Thurs Aug 16		
8:30 - 10:10	Session 1- EI Preparation for Modeling	Regency Ballroom #2
	Session 8 - Mobile Sources	Regency Ballroom #5
	Session 10 - Air Toxics	Regency Ballroom #7
10:10 - 10:40	**BREAK**	
10:40 - 1l:55	Session 2 - Biomass Burning Panel Discussion	Regency Ballroom #2
	Session 8 - Continues	Regency Ballroom #5
	Session 7 - GIS/Innovative Methods/Remote Sensing	Regency Ballroom #7
12:00	**Conference Concludes**	

TRAINING SCHEDULE

Monday – August 13, 2012

Course Title: Emission Inventory System (EIS)
Instructor: Sally Dombrowski, Madeleine Strum, Roy Huntley and Laurel Driver US EPA
Time: 8:30am – 5:00pm

Course Description
This course is a repeat of the webinars offered to State/Local and Tribal agencies over the past several months. We will cover the required data elements needed to report your facility, point, nonpoint, onroad, nonroad and event inventories. Use of the Bridge Tool, the procedure for submitting data using the Web Client, and an overview of the EIS Gateway will also be covered. We will also cover any changes that will be applicable to the 2011 inventory effort. Intended audience - State/Local Agencies, Tribes, Contractors

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Course Title: An Introduction to Using MOVES at the National and County Levels
Instructor: Gary Dolce, Chris Dresser and Trish Koman, US EPA Office of Transportation and Air Quality
Time: 8:30am – 5:00pm

Course Description:
MOVES2010 is EPA's current approved model for estimating air pollution emissions from on-road vehicles for regulatory purposes. This course will provide a general introduction to using of MOVES at the national level and as well as a more detailed look to using MOVES at the county level, as required for SIPs and regional conformity analyses. It will include extensive hands-on training exercises including creation of a Run Specification file and use of the County Data Manager to input local data. This course is an updated one-day version of the 2-day course EPA and FHWA staff has been giving since the release of MOVES2010. It reflects changes in the latest version of MOVES (MOVES2010b).

PARTICIPANTS MUST BRING THEIR OWN LAPTOP COMPUTERS WITH THE LATEST VERSION OF MOVES2010 AND THE MOVES2010 DATABASE ALREADY INSTALLED AND TESTED PRIOR TO THE BEGINNING OF THE COURSE.

Course trainers will not have time to help with installations of MOVES2010 during the course. Participants should make sure that their installation of MOVES2010 is operational before they arrive at the course. MOVES2010 and associated documents are available at http://www.epa.gov/otaq/models/moves/index.htm.

Users should also have Microsoft Excel or other spreadsheet software capable of opening Excel files on their laptops.

This is an introductory course and primarily aimed at students who have not previously taken a hands-on MOVES course and who do have extensive experience with MOVES. **Class size will be limited to 40 students with laptop computers**. Organizations should limit the number of students sent to allow space for the maximum number of individual organizations to attend.

Course Title: Control Strategy Tool (CoST) for States/Local/Tribes
Instructors: David Misenheimer and Alison Eyth, US EPA
Time: 8:30am – 5:00pm

Background:
EPA developed the Control Strategy Tool (CoST) to allow users to estimate the emission reductions and costs associated with future-year control strategies, and then to generate emission inventories with the control strategies applied. CoST tracks information about control measures, their costs, and the types of emissions sources to which they apply, including point, nonpoint, onroad, and nonroad mobile sources. EPA developed CoST primarily to support agency Regulatory Impact Analyses (RIAs) for National Ambient Air Quality Standards (NAAQS). However, EPA recognizes that this tool may also be useful to State/Local/Tribal air management personnel responsible for preparing control strategies for State Implementation Plans.

Course Description:
This hands-on course will introduce participants to CoST. The training will cover:

- Managing, viewing, and editing control measures
- Creating, editing, and reviewing the results of control strategies to see the levels of cost and emissions reductions that would be achieved
- Limiting a control strategy to a specified geographic region
- Setting control strategy constraints/limits

PARTICIPANTS MUST BRING THEIR OWN LAPTOP COMPUTERS WITH THE LATEST VERSION OF CoST AND ASSOCIATED DATABASES ALREADY INSTALLED AND TESTED PRIOR TO THE BEGINNING OF THE COURSE.

Course trainers will not have time to help with installations of CoST during the course. Participants should make sure that their installation of CoST is operational before they arrive at the course.

CoST and associated documents and databases will be made available to course participants at least 3 months prior to the training course.

Users should also have Microsoft Excel or other spreadsheet software capable of opening Excel files on their laptops. Course participants should also be familiar with basic terminology and concepts concerning emission inventories and control strategy development.

Class size will be limited to 15 students.

Course Title: Utilizing Local Fire Information to Develop a National Emissions Inventory for Fires through Smartfire 2
Instructor: Sim Larkin, USFS and Sean Raffuse, Sonomatech
Time: 8:30am – 12:00pm

Course Description:
Wildland fire information is available through a wide variety of sources – satellite systems that detect fires and burn scars, and ground reporting systems at the national, state, and local levels that report wildfires and/or prescribed burns. The new SmartFire 2 system has been designed to utilize the available data in order to enable the creation of inventories for wildland fire that leverage multiple sources and take advantage of the unique capabilities of each system.

This course is for anyone interested in how SmartFire 2 works in general, how it associates and reconciles disparate data streams, and the specific requirements for submitting data to SmartFire 2 for incorporation into the next NEI. The course is divided into two parts – the first part (~ 2 hours) will be for anyone interested in the system; the second (~ 2 hours) will be aimed at data submitters and how to submit data.

If possible, participants are encouraged to look at the preliminary 2011 NEI wildland fire numbers before attending. Data submitters attending Part 2 are encouraged to send the organizers a sample dataset from your state / region for discussion.

Topics covered will include:

Part 1: For everyone:

- The SmartFire 2 system
- How SmartFire2 and the BlueSky Framework can be used to create an emissions inventory
- What was done for the 2008 NEI for wildland fire version 2
- Types of data usable by SmartFire 2
- Association algorithms used by SmartFire 2
- Reconciliation options available in SmartFire 2
- Fuels, consumption, and emissions options in BlueSky
- Known uncertainties in wildland fire emissions
- Current development efforts
- Documentation and where to access / obtain SmartFire 2 and BlueSky

Part 2: For data submitters:

- Formats that SmartFire 2 can read
- How to submit data
- What will happen to submitted data
- Will this data work? Discussion using data provided by attendees
- Q&A for data submitters

Class size will be limited to 40 students and internet connection required for the instructor.

Course Title: US Greenhouse Gas Emissions Inventory and Greenhouse Gas Reporting Program Data Publication Tool
Instructor: Leif Hockstad and Brian Cook, US EPA
Time: 1:00pm - 5:00PM

Course Description:
EPA publishes both the annual national level Inventory of U.S. Greenhouse Gas Emissions and Sinks, and greenhouse gas emissions data collected through the Greenhouse Gas Reporting Program through an online data publication tool. The Inventory of U.S. Greenhouse Gas Emissions and Sinks is a comprehensive top-down assessment of national GHG emissions, and presents emissions across multiple years starting in 1990. EPA uses national energy data, data on national agricultural activities, and other national statistics to provide a comprehensive accounting of total GHG emissions for all man-made sources in the United States. The GHG Reporting Program collects bottom-up data from individual facilities, mainly above certain emissions thresholds. Through this program and its coverage, EPA provides specific facility and supplier-level data for approximately 85-90% of total U.S. GHG emissions. EPA collected data from facilities through the GHGRP for the first time in 2010, and has published emissions data from all facilities covered by the GHGRP through an online data publication tool.
This course is for anyone interested in these complimentary greenhouse gas emissions data sets published by EPA. The course is divided into two parts – the first part (~ 1.5 hours) will focus on the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010, the most recent annual report on national level greenhouse gas emissions, and its calculation methodologies and time series trends information. The second (~ 2.5 hours) will focus on the Greenhouse Gas Reporting Program's data publication tool, the greenhouse gas emissions data presented in it, and how to use the program's data publication tool.
If possible, participants are encouraged to look at the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010 (http://www.epa.gov/climatechange/emissions/usinventoryreport.html) and the data publication tool for the Greenhouse Gas Reporting Program (http://ghgdata.epa.gov/ghgp/main.do).

Topics covered will include:
Part 1: The Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010

- History, purpose, and scope of this report
- Coverage of sources and sectors in the U.S.
- Data sets and methodologies used in calculating national greenhouse gas emissions
- Recent trends and long-term trend drivers
- Updates expected in future reports
- Q&A

Part 2: Greenhouse Gas Reporting Program Greenhouse Gas Data from Large Facilities – Data Publication Tool

- Brief introduction to the Greenhouse Gas Reporting Program (GHGRP)
- Basic features of the GHGRP Data Publication Tool
- How to view data in various formats, such as maps and graphs for individual facilities or groups of facilities
- How to search the data set, such as for individual facilities by name or location
- How to filter the data set, such as by state or county, and by industry sectors and sub-sectors
- Q&A

Poster Session and Exhibitors Reception

Tuesday - August 14, 2012 6:00 - 8:00 pm

1. "Emission Factors for Light and Heavy-Duty Vehicles Based on Road Tunnel Measurements in Sao Paulo, Brazil", M. de Fatima Andrade, A. Fornaro, R. Maura de Miranda, R, Yuri Ynoue and E. Dias de Freitas, Atmospheric Sciences Department Instituto of Astronomy, Geophysics and Atmospheric Sciences University of Sao Paulo, Brazil

2. "How to use eGRID for Carbon Footprinting Electricity Purchases in Greenhouse Gas Emission Inventories", A. Diem, US EPA; S. Rothschild and C. Quiroz, TranSystems | E. H. Pechan

3. "Development of Geospatial Data and Tools for Wildland Fire Emissions Modeling for the US", N. French, J. McCarty, T. Erickson, B. Koziol and M. Billmire, Michigan Tech Research Institute, Ann Arbor MI; D. McKenzie, USDA Forest Service, Pacific Northwest Research Station, Seattle, WA

4. "The Indirect By-Product Effect of the Introduction of Biofuels", G. Barrow and D. Zilberman, UC Berkeley; G. Hochman, Rutgers University

5. "Development of MOVES-Mexico", H. Yang and W. Li, UTEP; G. Ayala, International Communities Research Center; G. Pinal, El Paso MPO; V. Valenzuela, TCEQ, Region 6

6. "Emissions of Radical Precursors and Related Species from Traffic in Houston, Texas – Implications for Air Quality Modeling", G. Lubertino, Houston-Galvestion Area Counsel; B. Rappenglueck, S. Alvarez, J. Golovko, B. Czader and L. Ackermann, University of Houston

7. "Derivation of a New Smoke Emissions Inventory using Remote Sensing and its Implications for Near Real-time Air Quality Applications", L. Ellison, (Science Systems and Applications, Inc) and C. Ichoku, NASA Goddard Space Flight Center

8. "A New Mobile Laboratory for Greenhouse Gas Source Attribution Studies", R. P. Bamha, H. A. Michelsen and P. E. Schrader, Sandia National Laboratories, Livermore, CA; F. M. Helsel and M. D. Ivey, Sandia National Laboratories, Livermore, NM

9. "Integrating Source and Receptor Models for the Purpose of Emissions Inventory Improvement – Application to Biomass Combustion in the Southeast", S. Napelenok, R. Vedantham, G. Pouliot and P. Bhave , US EPA

10. "Bureau of Ocean Energy Management (BOEM) Gulf of Mexico Emissions Inventories", D. Wilson, R. Oommen, S. Enoch and R. Billings, Eastern Research Group; H. Ensz, Bureau of Ocean Energy Management

11. "The Julich Interoperable Web Services for Modeling and Emission Data Sets", M. G. Schultz, M. Decker, Sebastian Luhrs, O. Stein and S. Schroder, Research Centre Julich

12. "Effect of Location Coordination on RTR Risk Results", A. Pope, B. Stitt, M. Stewart and C. Boswell, US EPA; S. Enoch, Eastern Research Group

13. "CAROL: Making the Great Lakes Regional Toxic Air Emissions Data Available On-Line", A. Soehl and G. Wang, Great Lakes Commission, C. Yi Wu, Minnesota Pollution Control Agency and X. Luo, Institute for Geospatial Research & Education, Eastern Michigan University,

14. "Emissions Impacts from Using B20 Fuel in the Current Transit Bus Fleet", M. Thornton, P. Sindler, M. Lammert and R. McCormick, National Renewable Energy Laboratory, CO

15. "Sulfur Dioxide and Primary Carbonaceous Aerosol Emissions from China and India during 1996-2010", Z. Lu and D. G. Streets, Decision and Information Sciences Division, IL; Q. Zhang, Center for Earth System Science, China

16. "Comparing Two National Datasets of CO_2 Emissions for US Powerplants", J. Huang and K. Gurney, Arizona State University, School of Life Sciences

17. “Development of a Grid-Based Emission Inventory and a Source-Receptor Model for Dhaka City”, T. Afrin, M. Ashraf Ali, S. M. Rahman and Z. Wadud, Department of Civil Engineering, Bangladesh University of Engineering and Technology, Bangladesh

18. “Utilizing Nonparametric Wind Regression to Determine Potential Source Contributions in Gary, IN”, M. Rizzo, US EPA Region 5; V. Rao, US EPA

19. “Sub-canopy Transport and Dispersion of Smoke: A Unique Observation and Model Evaluation”, R. Mickler, Alion Science and Technology; T. Strand, Scion Research; C. Clements, San Jose State University and B. Lamb, Washington State University

20. “Assessing Precision and Accuracy of Atmospheric Emission Inventories”, J. I. Huertas, M. E. Huertas and J. Diaz, Automotive Engineering Research Center –CIMA, Toluca, Mexico

21. “Measuring and Modeling Fugitive Emissions from Natural Gas Development in the Haynesville Shale”, R. J. Caruso and M. L. Bell, Yale University, New Haven CT

22. “Characterization of Mega-City CO_2 Emissions at High Spatio-Temporal Resolution: Application to Los Angeles”, A. Eldering, R. Duren, S. Sander and C. Miller, Jet Propulsion Laboratory, California Institute of Technology, CA; K. Gurney, Y. Song and I. Razlivanov, School of Life Sciences, Arizona State University, AZ

23. “Toxics Release Inventory (TRI), and Its Use in the 2008 National Emission Inventory”, M. Strum, L. Tooly and V. Rao, US EPA

24. “2008 National Emission Inventory”, R. Ryan, M. Strum, R. Huntley, L. Driver, V. Rao and S. Dombrowski, US EPA

25. “Reducing Transportation Related Emissions through Connected Vehicle Technology Applications: A Benefit Assessment”, E. Pindilli, V. Adams and J. Glassman, Booz Allen Hamilton

26. “What’s New in SPECIATE 4.3”, F. Divita and Y. Hsu, Abt Associates

27. “Freight from Space: Evaluating Freight Activity and Emissions Trends from Satellite Data”, E. Bickford, T. Holloway and J. Oberman, University of Wisconsin-Madison and M. Janssen, Lake Michigan Air Directors Consortium

28. “Evaluate Wildfire Emissions in the Canadian GEM-MACH Air Quality Forecast System”, J. Chen, S. Gravel, R. Pavlovic, K. Anderson and A. Pankratz,

Exhibitors

Eastern Research Group – Eastern Research Group, Inc. (ERG) offers clients the full spectrum of technical services required to achieve successful air quality management. Our staff of over 350 strong consists of engineers and atmospheric scientists with over 27 years of experience addressing air quality needs at all project scales for stationary and mobile sources. The bulk of our experience rests with public agencies in the federal, state, local, and tribal government sectors. ERG performs nationally recognized research in areas such as greenhouse gas emissions and controls, air permitting, air toxics, emissions assessments, emissions projections, air regulation development, inventory management, and ambient air quality monitoring. We can assist you with defining and quantifying problems, and determining the most technically effective and cost-beneficial solutions for all stakeholders. Our conference exhibit booth will have materials available documenting the breadth of this experience, and key staff from these programs will be on hand to meet you and provide more detailed information and insight on how our capabilities can address your needs.

KB Environmental Sciences, Inc. - specializes in providing air quality, noise, haz. mat., greenhouse gases and health risk assessment services to a wide array of private and public clients across the U.S. and around the world. As a small business, the company is streamlined, easily accessible and able to offer individual attention to the unique and challenging issues in the environmental field. KBE is also a certified Woman Business Enterprise (WBE) in all 50 states.

S4 Strategy Web Design - S4 Strategy is Website Design Company and unlike most web design companies we have a CMS (Content Management System) web framework that once we build your custom website you can easily add and make changes to your website with a simple web browser from anywhere you have an internet connection, no HTML code experience needed. Why is this important? So you are not dependent on your web company every time you want to make a simple change. We also have over a decade of proven internet marketing and search engine optimization experience. In addition, we offer Social Media online marketing and world-class web hosting for your investment. We are a one-stop shop for ALL your online needs.

TranSystems Corporation – TranSystems, a private company incorporated in 1966, is comprised of more than 1,000 engineering and consulting professional in 43 offices throughout the United States and headquarters in Kansas City, MO. TranSystems provides comprehensive services in all transportation modes. TranSystems acquired E. H. Pechan & Associates, Inc in December 2010. Pechan has a 30-year history in providing comprehensive emission inventory support services to EPA, Regional Planning Organizations, States and Local agencies. This includes criteria air pollutant, hazardous air pollutant and greenhouse gas emission inventory development. TranSystems' Climate Change Services Group provides third party greenhouse gas verification services to organizations.

TRI Explorer – The Office of Environmental Information, Office of Information Analysis and Access, manages the Toxic Release Inventory (TRI) program. The TRI database contains information on releases and other waste management activities of over 680 toxic chemicals and chemical categories. Data is accessible to other EPA Offices, federal agencies, ngos and the public through products, data feeds and the internet to meet the unique needs of individual data consumers. Some of the tools incorporate value added data layers such as tribal boundaries, watersheds, school districts, MSAs and more. OIAA staff will be available during the conference to demonstrate some of the tools and provide hands-on training. Data from the 2011 reporting period, is currently available through some access points and includes the reporting of 16 additional chemicals classified by the National Toxicology Program (NTP) as "reasonable anticipated to be a human carcinogen".

Trinity Consultants/T3 – For over 30 years, Trinity Consultants has assisted industrial facilities with regulatory compliance and environmental management issues. T3, a division of Trinity Consultants, helps business operate more efficiently and cost-effectively, while improving environmental, health, and safety (EH&S) performance. The unique mix of extensive experience in EH&S consulting, software development, system support and training allows T3 to harness the power of technology to help streamline your EH&S information management practices.

T3's wide-range of solutions include the handheld Pocket Solutions ™ for collecting and managing field EH&S and maintenance data; custom compliance solutions for specific recordkeeping and reporting requirements; and implementation of third-party multi-media enterprise software. We work closely with you to determine the suitable approach to meet your needs and implement the solution quickly and intelligently. T3 is committed in every way to help you achieve the highest levels of business performance and EH&S regulatory compliance.

US EPA - Emission Inventory & Analysis Group (EIAG) – The Emission Inventory and Analysis Group is responsible for developing the National Emissions Inventory (NEI), a national database of air emissions information. NEI is a compilation of data comprising of input from numerous state and local air agencies, tribal nations, industry, and other federal databases. The NEI database contains information on stationary and mobile sources that emit criteria air pollutants and precursors, as well as hazardous air pollutants. NEI data are used for air dispersion modeling; tracking emission trends and developing risk assessments, regulations and regional pollution control strategies. Staff will be available to answer your questions on the Emission Inventory System (EIS), the Emissions Modeling Framework (EMF), mobile models, the Risk Technology Rule, the Air Emissions Reporting Rule (AERR) and analysis of the National Emission Inventory data.

Windsor Solutions, Inc – Windsor Solutions, Inc. is an information systems consulting firm headquartered in Portland, Oregon. Windsor was founded in 1998 to specialize in the provision of environmental information systems to federal, state, local, and tribal government organizations. Windsor has an exceptional national reputation for the delivery of high quality environmental information system solutions.

The State and Local Emissions Inventory System (SLEIS) allows permitted facilities to submit point source emissions inventory data and related meta-data to state and local agencies via a Web-based, CROMERR-compliant reporting system. SLEIS positions organizations to better manage and review collected data, including the quality assurance of emissions inventory data submitted by regulated entities. SLEIS also includes an Exchange Network interface to manage the generation and submission of XML files to EPA's Emissions Inventory System (EIS).

SLEIS enables the regulated community to meet reporting obligations by providing a secure, intuitive, and streamlined interface for the submission of facility inventory and emissions data and meta-data. SLEIS also brings much greater efficiency to the collection, processing, analysis, and quality assurance of emissions inventories for the consortium partners, while allowing each member of the consortium with the ability to configure the system to meet their own unique needs.

Tuesday, August 14, 2012

Session 1: EI Preparation for Modeling

Chairs: Alison Eyth, US EPA
Wayne Boulton, RWDI

1:00 "2007/2008 Emissions Modeling Platform Components and New Tools", R. Mason, A. Eyth and A. Zubrow, US EPA; Z. Adelman, Institute for the Environment, UNC

The U.S. Environmental Protection Agency (EPA)'s Office of Air Quality Planning and Standards (OAQPS) is currently developing a 2007/2008 emissions modeling platform. The emissions for this platform are based on Version 2 of the 2008 National Emissions Inventory (NEI) along with several updates and non-NEI components in the oil and gas, onroad mobile, nonroad mobile and EGU sectors. We will briefly describe why we are developing a year 2007 modeling platform in addition to a 2008 platform. We will describe several of the analyses performed to improve the emissions in the modeling platform, including reconciliation between state/local, EPA-generated estimates, and regional planning organization (RPO) data. We will also describe newly-incorporated enhancements to the processing for residential wood combustion, agricultural ammonia, onroad, fugitive dust and fire emissions. We will discuss steps taken to support CMAQv5 along with enhancements to ancillary input files for the platform such as new spatial surrogates, temporal profiles, and speciation profiles. We will describe updates made to V2 of the NEI as a result of our analyses, as well as sources that undergo the largest changes between our most recent 2005 platform and the 2007 modeling platform.

1:25 "Preparation of Oil and Gas Emissions Inventories for Use in Photochemical Grid Modeling", E. K. Pollard and S. B. Reid, Sonoma Technology, Inc; J. Reed and C. Taylor, AECOM and B. Bohlmann, Wyoming Department of Environmental Quality

In recent years, elevated 8-hour ozone concentrations have been observed during "winter" months (February and March) in the Upper Green River Basin (UGRB) in southwest Wyoming, where significant oil and gas development activities are occurring. To support air quality management in the region, AECOM and Sonoma Technology, Inc., are conducting photochemical grid modeling with the Community Multiscale Air Quality Model (CMAQ) and the Comprehensive Air Quality Model with extensions (CAMx) to determine the model that best replicates winter ozone formation processes in the UGRB.

To support this effort, the project team is converting detailed oil and gas emissions inventories for the winter of 2008 to air quality model-ready formats. These inventories were developed by the Air Quality Division of the Wyoming Department of Environmental Quality (WDEQ) and contain detailed emissions data for all permitted wells. Emissions are estimated for criteria pollutants, nitrous acid (HONO), and formaldehyde for a variety of sources, such as drill rigs, tanks and pressurized vessels, dehydration units, pneumatic pumps, and process heaters. For select sources, the inventory also contains detailed data that is not typically available, such as speciated volatile organic compound (VOC) emissions, stack parameters, and spatial and temporal information for intermittent sources.

Emissions data for the winter of 2008 are being converted to formats compatible with the Sparse Matrix Operator Kernel Emissions (SMOKE) model, with individual oil and gas equipment modeled at the well head as discrete point sources. This paper will describe the processes used to prepare the detailed oil and gas inventories and the other main source sectors (e.g. mobile, nonpoint, point, fire, and biogenic) for use in air quality modeling applications.

1:50 "Development of a Crop Residue Burning Emission Inventory for Air Quality Modeling", G. Pouliot, US EPA; J. McCarty, Michigan Tech Research institute; and A. Soja, Institute of Aerospace NASA Langley Research Center

Biomass burning has been identified as an important contributor to the degradation of air quality because of its impact on ozone and particulate matter. One component of the biomass burning inventory, crop residue burning, is poorly characterized in the National Emissions Inventory. We summarize a new method to estimate crop residue burning emissions using remote sensing data and field information. We will focus on the both post harvest and pre-harvest burning that takes place with bluegrass, corn, cotton, rice, soybeans, sugarcane and wheat. Estimates for 2006 indicate that over the continental United States (CONUS), crop residue burning occurred over 5.8 million acres of land and produced 53,000 short tons of PM2.5. Estimates for 2007 indicate that over the CONUS, crop residue burning occurred over nearly six million acres of land and produced 58,000 short tons of PM2.5. Preliminary modeling results using this new inventory within a chemical transport model are also summarized

2:15 "Model Sensitivity to MACC Anthropogenic and Biogenic Emissions: Global Simulations and Evaluation for Reactive Gases", O. Stein and M. G. Schultz and A. Heil, Research Centre Jülich; I. Bouarar and L'Atmos, UPMC Paris; H. Clark, Météo France, CNRM, Toulouse ; E. Katragkou, Aristotle University of Thessaloniki; J. Leitao, IUP, University Bremen and, Research Centre Jülich

A global emission inventory for reactive gases has been developed as part of the European project MACC (Monitoring Atmospheric Composition and Climate). ACCMIP emissions were extrapolated for years after 2000 with the RCP8.5 scenario and extended for VOCs and several other species. This inventory composes the MACCity anthropogenic emission inventory. During the MACC project it became apparent that using MACCity in reanalysis simulations for recent years led to an underestimation of CO concentrations in the Northern Hemisphere when compared to independent observations. We conducted MOZART offline simulations for the year 2008 to test the sensitivity of a global chemical transport model to the varying emissions. Therefore we ran MOZART with different sets of emissions: 1. MACCity emissions, 2. The GEMS/RETRO emission inventory, 3. MACCity emissions, but with increased traffic CO emissions. While using the emission inventory developed in RETRO gives quite reasonable tropospheric concentrations for the key species, the MACCity CO emissions are too low, particularly during NH winter. When increasing MACCity CO traffic emissions by a constant factor, the simulations result in a better representation of surface and satellite observations for Europe, but not for other parts of the world. A refined scaling needs to be applied to the inventory which enhances anthropogenic CO and VOC emissions significantly. Increasing biogenic emissions result in unrealistic high summer concentrations and are therefore not considered as potentially missing sources. The results point to significant underestimation of traffic CO emissions in the MACCity emission inventory, which is potentially amplified by an unrealistic emission reduction 2000-2010 in the RCP8.5 scenario.

2:40 **BREAK**

3:10 "Improving the Spatial Allocation of Construction Emissions in Canada", M. Sassi and L. Boucher, Air Quality Modeling Applications Section, Meteorological Service of Canada; A. Leroux, Environmental Emergency Response Section, Meteorological Service of Canada

In Canada, construction operations are a significant source of dust emissions, and can have a substantial impact on regional air quality. Primary PM2.5 emissions from this sector account for 19% of the total anthropogenic PM2.5 in the Canadian 2006 inventory. This sector is broken down into heavy construction (75%), road construction (24%) and residential/non-residential construction (1%). As Canadian area emissions inventories are calculated at the provincial level, the accuracy of the gridded model-input emissions files is highly dependent on the choice and quality of the spatial surrogates. A new set of spatial surrogates was developed with several vectorized geographical features. For example, mines, pits and industrial areas, were used for heavy construction surrogate; population growth between 2006 and 2011 were used for residential/non-residential construction surrogate; and the Canadian National Road Network (2007) from Natural Resources Canada was used for road construction surrogate. In addition to spatial surrogates, one key adjustment to dust emissions is a correction called transportable fraction (TF). In Alberta, land use data for oil sands region was updated with mining development for TF calculations. These changes in emission were implemented in a step-wised manner for the Canadian 2006 emissions inventory. The result showed a significant change in gridded PM10 and PM2.5 emissions in urban and rural areas. Detail changes in the modeled air quality emission will be presented.

3:35 "Improvements to SMOKE Processing of Canadian On-Road Mobile Emissions", J. Zhang, Q. Zheng, M. Moran, M. Gordon, J. Liggo and P. Makar, Air Quality Research Division, Environment Canada; B. Taylor, Pollutant Inventories and Reporting Division, Environment Canada

On-road motor vehicles are important sources of pollutants that affect air quality, especially in cities. A previous study found that there was a strong qualitative difference in SMOKE-processed on-road mobile emissions across the Canada-U.S. border, due mainly to differences in the spatial surrogates and temporal profiles used for the two countries1. To better represent Canadian on-road mobile emissions spatially, temporally, and chemically in air quality models, SMOKE processing of Canadian on-road mobile emissions was investigated and the following improvements were made: (1) a new set of spatial surrogates was generated based on the Canadian National Road Network and population shapefiles and the Canadian on-road inventory was modified to split emissions between different road types in order to allow use of the new surrogates; (2) a new set of Canadian weekday/weekend diurnal profiles was created based on vehicle-type traffic-count data for a major Canadian highway and existing EPA temporal profiles; (3) a new set of province-specific monthly temporal profiles was calculated for fugitive dust emissions from paved and unpaved roads based on monthly Vehicle Kilometres Travelled (VKT) statistics; (4) a new set of PM chemical speciation profiles was built based on the SPECIATE 4.3 database. These improvements are described in more detail and the impacts of these improvements on processed Canadian on-road mobile emissions are shown and discussed in this paper.

4:00 "Temporal and Spatial Detail in Mobile Source Emission Inventories for Regional Air Quality Modeling", A. DenBleyker, R. E. Morris, C. E. Lindhjem, L, K. Parker, T. Shah, B. Koo, ENVIRON International Corporation; C. Loomis, Alpine Geophysics LLC and J. Dilley, Denver Regional Air Quality Council

Accurate spatial and temporal characterization of emissions is necessary to inform air quality planning. The purpose of this paper is to quantify the impacts of using detailed traffic activity data on mobile source emissions estimates and air quality in the Denver urban area. This study compares on-road mobile source emission inventories developed for eleven counties covering the Denver Metropolitan Area and North Front Range (DMA/NFR) in Colorado and reports the spatial and temporal differences of ozone precursor emissions and their effects on modeled ozone concentrations. Three on-road mobile source emission inventories were developed to generate the gridded hourly chemically speciated emission inputs for photochemical grid modeling of the DMA/NFR nonattainment area (NAA) to support the Denver 8-hour ozone State Implementation Plan (SIP).

1) Link-Level modeling for the DMA/NFR, using emissions processing software CONCEPT Motor Vehicle v2.1

2) Non-Link Level modeling for Colorado including DMA/NFR, using emissions processing software SMOKE v3.0 with SMOKE-MOVES Integration Tools

3) County Level modeling for the U.S., using MOVES2010a Inventory Calculation

Emissions differences are apparent in the overlapping DMA/NFR region between the three scenarios, resulting from the methods of how MOVES2010a emission factors were combined with vehicle activity, such as vehicle miles traveled and speed. Key differences in modeling approaches include hourly fleet mix, hourly link-level speeds, spatial allocation of off-network emissions and treatment of meteorology, which impacts the spatial distribution, magnitude and the timing of total organic gases (TOG) and oxides of nitrogen (NOX) emissions from vehicles. Compared with SMOKEMOVES, the use of detailed transportation data with CONCEPT MV decreases the on-road TOG/NOX ratio and results in modeled ozone differences up to 1.5 ppb in 8-hour average ozone on the highest 2008 ozone day in Denver. This study has important implications for any urban area where motor vehicles are significant contributors to overall emissions.

4:25 **Open Discussion** - Discussion on Community-Based Emissions Modeling Needs

Session 2: Biomass Burning

Chairs: Amber Soja, NASA
Sim Larkin, USFS
Jessica McCarty, MTU

1:00 "The Version 4 Global Fire Emissions Database (GFED4) Burned Area Component", L. Giglio, UMD and J. T. Randerson UC Irvine

We describe the burned area component of the version 4 Global Fire Emissions Database (GFED4), which will provide global, daily burned area and biomass burning emissions at 0.25° spatial resolution from mid-2000 through the present. Cross-calibration of fire observations from the Tropical Rainfall Measuring Mission Visible and Infrared Scanner (VIRS) and the Along-Track Scanning Radiometer (ATSR) with 500-m MODIS burned area maps allows the data set to be extended further back in time, though at a reduced temporal resolution. We include a discussion the spatially explicit uncertainty estimates accompanying our data set, and the use of these estimates within atmospheric and biogeochemical models. We then discuss plans for the integration of fire observations from the Suomi-NPP Visible-Infrared Imager-Radiometer Suite (VIIRS) into GFED to extend the data set into the future.

1:25 "Development of the Version 2 2008 Wildland Fire Emission Inventory", S. Raffuse and Y. Du; Sonoma Technology, Inc, P. Lahm and N. Larkin, USDA Forest Service

Emissions from wildland fires represent a large fraction of the total mass of particulate matter emitted in the United States. We present the methods and results for the national-scale processing of version 2 of the 2008 wildland fire National Emissions Inventory (NEI). The version 2 NEI was produced using fire activity data from SmartFire 2 (SF2) and emissions processing in the BlueSky smoke modeling framework.

Additionally, guidance and feedback from experts were utilized in determining input data sets and processing streams. This is important because both BlueSky and the newly redesigned SF2 are frameworks that contain multiple modeling processing pathways and options. Wildland fire emissions of PM2.5 were estimated at 1,716,000 tons, which represents 28% of the total PM2.5 from the NEI.

1:50 "Comparative Fire Emissions Analysis: the DEASCO3 Project and the EPA 2008 NEI", M. E. Mavko, D. Randall, Air Sciences, T. Moore, Western Governer's Association; M. Fitch, National Park Service

As part of the Deterministic & Empirical Assessment of Smoke's Contribution to Ozone (DEASCO3) project, we are building a national fire emissions inventory for year 2008 air quality modeling. For the western U.S., the analyses applied in building this detailed retrospective inventory supports subsequent air quality planning and possible future exceptional events analyses. Methods used were built off of previous inventory work done for the Western Regional Air Partnership (WRAP) and the on-going Fire Emissions Tracking System (FETS). The basis of the 2008 emissions inventory is the existing FETS database and methodology. To gather additional activity data, the FETS was expanded to accept data from the Monitoring Trends in Burn Severity (MTBS) data set, Hazard Mapping System (HMS) data, and ground-based reports from areas outside the WRAP region. A reconciliation process using date and proximity matched HMS detects with MTBS perimeters and ground-based activity to build daily fire growth for MTBS burns. Detects without a match were classified using a set of criteria including land ownership, land cover type, time of year, and proximity to classified burns. Emissions were calculated for all burns using Python-CONSUME, the latest 30m Fuel Characteristics Classification System (FCCS) layer, and MTBS burn severity. Other supporting information included daily precipitation maps and fuel moisture from the Weather Information Management System (WIMS). Calculated fire emissions were then compared to those from the EPA 2008 NEI for selected regions and time periods. We will present the differences in space, time, and emissions magnitudes to assist NEI and DEASCO3 users in understanding the emissions results, evaluating the methodologies behind the reported emissions, and considering the applications of data for air quality planning and exceptional event analyses.

2:15 "Review of Emissions Inventories for Wildland Fires in Georgia", D. Tian and T. Zeng; Georgia Department of Natural Resources, Environmental Protection Division and School of Earth and Atmospheric Sciences, Georgia Institute of Technology; J. Boylan, ; Georgia Department of Natural Resources, Environmental Protection Division

Fires burn more than a million acres of wildland per year in Georgia, emitting large amounts of pollutants such as particulate matter, nitrogen oxide (NOx), volatile organic compounds (VOC), and carbon monoxide (CO). Their emissions are first thoroughly inventoried as part of the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) 2002 fire inventory. They are calculated as the product of the amount of biomass consumed and the associated emission factors (ratios of the mass of pollutants emitted per unit biomass on a dry basis). The amount of biomass consumed is estimated from burned area records obtained by surveying state and federal agencies. Since then, emissions from wildland fires in Georgia have been estimated using the same or similar method for the following years: 2005, 2007 and 2008. In addition, fire emissions in 2008 have also been estimated by U.S. Forest Service using Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE) and BlueSky system. This work compares these available wildland fire emissions estimates for Georgia and the development methods. The differences found among these previous inventories provide important information to improve future wildland fire emissions inventory development, such as National Emissions Inventory 2011. The findings in this work can facilitate closer interdisciplinary cooperation between federal/state/local air quality and forest managers, as well as research communities in order to better understand emissions from prescribed fires, the major wildland fire type in the southeast, and their air quality impacts. The closer cooperation is in great need with implementation of the more stringent 2008 ozone National Ambient Air Quality Standard and the proposed more stringent PM2.5 standard.

2:40 **BREAK**

3:10 "Using Satellite Data to Quantify Cropland Burning and Related Emissions in the Contiguous United States: Lessons Learned", J. McCarty, Michigan Tech Research Institute; G. Pouliot and J. Szykman, US EPA; S. Raffuse, Sonoma Technology, Inc; M. Ruminski, NOAA/NESDIS and A. Soja, NIA/NASA

Prescribed fires in agricultural landscapes generally produce smaller burned areas than wildland fires but are important contributors to emissions impacting air quality and human health (McCarty, 2011). Currently, there are a variety of available satellite-based estimates of crop residue burning, including the

NOAA/NESDIS Hazard Mapping System (HMS) (Schroeder et al., 2008), the Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE) (Raffuse et al., 2009), the Moderate Resolution Imaging Spectroradiometer (MODIS) Official Burned Area Product (MCD45A1) (Roy et al., 2005; 2008), the MODIS Direct Broadcast Burned Area Product (MCD64A1) (Giglio et al., 2009), the MODIS Active Fire Product (MOD/MYD14) (Giglio et al., 2003; 2006), and a regionally-tuned 8-day cropland differenced Normalized Burn Ratio product for the contiguous U.S. (McCarty et al., 2008; 2009). Detailed comparisons of burned area and emission estimates from these datasets will be presented, with a focus on years 2003 through 2008, as well as methodological differences. For example, many of the operational remote sensing datasets derived from MODIS lack adequate training and validation data to accurately map prescribed fires from crop residue burning. Quantifying burned area in cropland landscapes from 8 km Geostationary Operational Environmental Satellite (GOES) Wildfire Automated Biomass Burning Algorithm (WFABBA) or 1 km MODIS MOD/MYD14A1 active fire detections require in-situ knowledge of field size and/or fire management practices. Satellite-based concentrations of aerosols from cropland burning case studies measured by MODIS Aerosol Optical Depth and the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) will also be included.

3:35 "A Wildland Fire Emission Inventory: Western United States Emission Estimates and an Evaluation of Uncertainty at Scales Relevant to Air Quality Modeling", S. Urbanski, W. M. Hao, S. Baker, US Forest Service, RMRS

Biomass burning (BB) emission inventories (EI) provide critical input for atmospheric chemical transport models used to understand the impact of biomass fires on air quality. Wildland fuel loadings are a significant source of uncertainty in U. S. BB EI. Fuel loading data from ~14,000 forest inventory plots has been used to quantify the bias in two commonly used wildland fuel loading models the Fuel Characteristics Classification System (FCCS) and the Fuel Loading Models (FLM) and asses the uncertainty in BB emission estimates due to uncertainty in fuel loading. In the aggregate, FLM underestimated total forest fuel loading by -3.4 kg m^{-2}, while FCCS overestimated total forest fuel loading by 0.9 kg m^{-2}. The FLM bias leads to underestimates in 2005 western U. S. forest fire emissions of 1840 Gg-CO, 263 Gg-PM2.5 and 490 Gg-NMOC. After correction of the FLM for bias, the uncertainty in ECO (at $\Delta x = 10$ km and $\Delta t = 1$ day) due to fuel loading averaged 26% for the western U. S. in 2005. This estimate of uncertainty in ECO does not consider uncertainties in A, CC, or EF.

4:00 "Emission Factors for CO_2, CO and Main Hydrocarbon Gases, and Biomass Consumption in an Amazonian Forest Clearing Fire", T. G. Soares Neto, V. O. Saito, E. Anselmo, F. Ferrari Dias and J. Carlos dos Santos. Instituto Nacional de Pesquisas Espaciais. Laboratório Associado de Combustão e Propulsão, Cachoeira Paulista, SP; J. Andrade de Carvalho Jr and E. Bastos de Amorim, Universidade Estadual Paulista- UNESP. Departamento de Energia, Guaratinguetá, SP and M. A. Martins Costa, Universidade Estadual Paulista- UNESP. Departamento de Engenharia Industrial Madeireira, Itapeva, SP

Emission factors for CO_2, CO and main hydrocarbon gases, as well as biomass consumption in an Amazonian forest clearing fire are presented and discussed. The experiment was conducted in the Western Amazon region, near the city of Cruzeiro do Sul, Acre state, Brazil. The average carbon content of dry biomass was 48% and the estimated average moisture content of fresh biomass was 42% on wet weight basis. The fresh biomass on the ground before burning was estimated as 583-ton ha^{-1} for larger parts of biomass with characteristic diameters larger than 10 cm. The small parts with characteristic diameters lower than 10 cm were quantified before burning on the ground and represented a value of 105-ton ha^{-1} with 17.1% humidity. The carbon content on the ground before burning was estimated to be 191-ton ha^{-1}. The overall biomass consumption for the experiment was calculated as 22.5% and 89.2% for larger and small parts of biomass, respectively. Excess mixing ratios were measured for CO_2, CO, CH_4, C_2–C_3 aliphatic hydrocarbons, and $PM_{2.5}$. Excess mixing ratios of CH_4 and C_2–C_3 hydrocarbons were linearly correlated with those of CO. The average emission factors of CO_2, CO, CH_4, NMHC, and $PM_{2.5}$ for three sampling hours were 1,513, 157.3, 8.17, 3.89, and 1.86 g kg^{-1} of burned dry biomass, respectively. Thus, one hectare of burned forest released about 232,115 kg of CO_2, 24.141 kg of CO, 1.254 kg of CH_4, 596 kg of NMHC and 285 kg of PM2.5.

Session 3: Greenhouse Gases

Chairs: Graciela Lubertino, H-G Area Council
Beth Hatter, SRA

1:00 "Understanding the Inventory of U.S. Greenhouse Gas Emissions and the Greenhouse Gas Reporting Program for Landfills: Methodologies, Uncertainties, Improvements and Deferrals", K. Bronstein and J. Coburn, RTI International and R. Schmeltz, US EPA

The Inventory of U.S. Greenhouse Gas Emissions and Sinks is a top down emissions inventory that estimates nationwide greenhouse gas emissions including methane emissions from municipal solid waste and industrial waste landfills using the 2006 Intergovernmental Panel on Climate Change Guidelines. A combination of datasets is used as inputs to the landfill section of the Inventory. Methane generation, recovery, and net emissions are estimated using data from these datasets at the national level, along with default values for certain parameters. The Greenhouse Gas Reporting Program (GHGRP), on the other hand, requires individual landfills meeting the applicability threshold to report detailed landfill characteristics and landfill methane emissions using a consistent methodology.

There are several differences between the Inventory and the GHGRP, including the methodology and data inputs used to determine net methane emissions. This paper provides an overview of each program and seeks to explain the differences between the methodologies. By using the GHGRP data, the Inventory may be improved to provide a more complete picture of greenhouse gas emissions from landfills in the United States. The GHGRP data elements that may be the most useful in terms of improving the Inventory's estimates have been deferred from reporting until 2013. However, once the deferral expires, the GHGRP data may help reduce uncertainties associated with the Inventory's emissions estimates.

1:25 "Iowa 2010 Greenhouse Gas Inventory – Challenges and Lessons Learned", M. S. Stein, Iowa Department of Natural Resources

Iowa law requires the Department of Natural Resources (DNR) to submit an annual report to the Governor and General Assembly regarding the greenhouse gas emissions in the state during the previous calendar year and forecasting trends in greenhouse gases (GHG). For the 2010 report, the DNR updated Iowa's 2005 statewide GHG emission inventory that was developed for the Iowa Climate Change Advisory Council. Statewide activity data from agriculture, fossil fuel combustion, industrial processes, natural gas transmission and distribution, transportation, solid waste, and wastewater treatment was used to develop the "top-down" inventory and policy-neutral report. It also included carbon sequestered from land use, land use change, and forestry (LULUCF). The completed report will be used to evaluate emission trends and develop a baseline to track progress in reducing emissions.

This paper will address the calculation methods, data availability, challenges, and lessons learned while developing the 2010 statewide GHG inventory. It will also highlight several current and future improvements. Finally, it will describe how Iowa's unique agriculture and industries affect activity data needs and resulting GHG emissions.

1:50 "How to use eGRID for Carbon Footprinting Electricity Purchases in Greenhouse Gas Emission Inventories ", A. Diem, US EPA and C. Quiroz, TranSystems | E. H. Pechan

There has been some confusion about which year of Emissions & Generation Resource Integrated Database (eGRID)'s sub region GHG emissions factors to use for specified years of electricity data under different conditions. There is no one completely consistent method that will work in all cases since the plants whose emissions are aggregated in the eGRID sub regions can change from year to year and the eGRID sub regions can sometimes change considerably.

The purpose of this paper is to provide some recommendations (and caveats) regarding which year(s) of eGRID sub region GHG emissions factors to use for estimating Scopes 2 and 3 GHG emissions from electricity use under various conditions.

The paper also reviews other recommendations and rationale for decisions relating to the use of eGRID data to estimate indirect emissions from electricity, including, but not limited to which output emission rates to use, which aggregation level to use, how to find the applicable electric grid region, how to include line losses. Examples and key data sets from the newly released eGRID2012 year 2009 data, found at www.epa.gov/egrid, will be presented.

2:15 “The Indirect By-Product Effect of the Introduction of Biofuels”, G. Barrow and D. Zilberman, UC Berkeley and G. Hochman, Rutgers University

Recent debates on the environmental benefits of biofuels have focused on the negative GHG effects of indirect land use change. In this paper we identify a heretofore unrecognized indirect effect of biofuels resulting from decreased supply of petroleum byproducts- the indirect byproduct effect (IBE). The IBE represents the change in GHG associated with the displacement of petroleum byproducts, which are eliminated or replaced with reduction in transportation fuel. We derive a range of values to capture the order of magnitude of this effect and find that it is likely to reduce the GHG emissions associated with biofuels and thus serve to offset the negative effect of indirect land use changes. Stylized numerical analyses suggest that when the IBE is included in the LCA, corn-based ethanol easily meets minimum requirements for renewable fuel credits under the Renewable Fuel Standards.

2:40 **BREAK**

3:10 “Understanding Greenhouse Gas Emissions from Unconventional Natural Gas Production”, K. Ritter and A. Emmert, American Petroleum Institute; S. Banaszak, America’s Natural Gas Alliance; M. Lev-On, The LEVON Group, LLC and T. Shires, URS Corporation

Natural gas comprises almost one-fourth of all energy used in the U.S. New technologies, sometimes referred to as “unconventional” have enabled the production of more natural gas and have expanded domestic energy reserves.

Natural gas is generally recognized as a clean-burning fuel source, producing less greenhouse gas (GHG) emissions per quantity of energy consumed than either coal or oil. However, a numbers of recent studies are raising questions as to the impact of these new production techniques - especially hydraulic fracturing - on the carbon footprint of natural gas. Current published assessments rely mostly on highly uncertain information provided in EPA’s November 2010 Technical Support Document (TSD) for mandatory GHG reporting from petroleum and natural gas systems, and from information associated with EPA’s Inventory of Greenhouse Gas Emissions and Sinks: 1990-2009.

It is becoming increasingly important to document the GHG emissions associated with the different stages of natural gas production in order to demonstrate the continued environmental benefits of natural gas. Therefore, technically sound quantification and assessment of GHG emissions from its lifecycle - from production to delivery to end-users - are essential. This paper will summarize results from a technical review of the emissions data used to develop EPA’s 2009 national inventory and the 2010 inventory updates. The paper will also discuss a collaborative effort between the American Petroleum Institute (API) and America’s Natural Gas Alliance (ANGA) to gather industry-specific information on emissions from key emission sources associated with unconventional natural gas production.

3:35 “Vulcan: National Scale High Resolution Quantification of Fossil Fuel CO_2 Emissions”, K. Gurney I. Razlivano and Y. Song, Arizona State University, School of Life Sciences; D. Mendoza, V. Chandrasekaran and S. Geethakuma, Purdue University, Department of Earth and Atmospheric Sciences; Y. Zhou, Joint Global Change Research Institute, MD

Quantification of fossil fuel CO2 emissions at fine space and time resolution is emerging as a critical need in carbon cycle and climate change research. As atmospheric CO2 measurements expand with the advent of a dedicated remote sensing platform and denser *in situ* measurements, the ability to close the carbon budget at spatial scales of ~100 km2 and daily timescales requires fossil fuel CO2 inventories at commensurate resolution. Additionally, the growing interest in U.S. climate change policy measures are best served by emissions that are tied to the driving processes in space and time. Here we introduce a high resolution data product (the “Vulcan” data product: vulcan.project.asu.edu) that has quantified fossil fuel CO2 emissions for the contiguous U.S. at spatial scales less than 100 km2 and temporal scales as small as hours. This data product, completed for the year 2002, includes detail on combustion technology and forty-eight fuel types through all sectors of the U.S. economy. The Vulcan data product is built from the decades of local/regional air pollution monitoring and complements these data with census, traffic, and digital road datasets. The Vulcan data product shows excellent agreement with national-level Department of Energy inventories, in spite of the different approach taken by the DOE to quantify U.S. fossil fuel CO2 emissions. Comparison to the global 1°x1° fossil fuel CO2 inventory used widely by the carbon cycle and climate change community prior to the construction of the Vulcan data product, highlights the space/time biases inherent in the population-based approach.

4:00 “Hestia: Urban Scale High Resolution Quantification of Fossil Fuel CO_2 Emissions at the Building/Street Scale for a Large US City”, K. Gurney, I. Razlivanov and Y. Song, School of Life Sciences, Arizona State University, AZ; Y. Zhou, Joint Global Change Research Institute, MD; B. Benes and M. Abdul-Massih, Department of Computer Graphics Technology, Purdue University IN

In order to advance the scientific understanding of carbon exchange with the land surface, build an effective carbon monitoring system and contribute to quantitatively-based U.S. climate change policy interests, fine spatial and temporal quantification of fossil fuel CO2 emissions, the primary greenhouse gas, is essential. Called the ‘Hestia Project’, this research effort is the first to use bottom-up methods to quantify all fossil fuel CO2 emissions down to the scale of individual buildings, road segments, and industrial/electricity production facilities on an hourly basis for an entire urban landscape. a large city (Indianapolis, Indiana USA). Here, we describe the methods used to quantify the on-site fossil fuel CO2 emissions across the city of Indianapolis, Indiana. This effort combines a series of datasets and simulation tools such as a building energy simulation model, traffic data, power production reporting and local air pollution reporting. The system is general enough to be applied to any large U.S. city and holds tremendous potential as a key component of a carbon monitoring system in addition to enabling efficient greenhouse gas mitigation and planning. We compare our estimate of fossil fuel emissions from natural gas to consumption data provided by the local gas utility. At the zip code level, we achieve a bias-adjusted pearson r correlation value of 0.92 ($p<0.001$).

4:25 “U.S. Onroad Transportation CO_2 Emissions Analysis Comparing Highly Resolved CO_2 Emissions and a National Average Approach: Mitigation Options and Uncertainty Reductions”, D. Mendoza, Department of Earth and Atmospheric Sciences, Purdue University; K. Gurney and I. Razlivanov School of Life Sciences, Arizona State University; S. Geethakumar and V. Chandrasekaran, CERIAS, Purdue University, IN; Y. Zhou, Pacific Northwest Laboratory, MD

In order to accurately quantify and regulate emissions in the U.S. onroad transportation sector, its spatial heterogeneity must be characterized. To portray a spatially-explicit fleet distribution, driving patterns, and mitigation strategies, we compare a high-resolution onroad emissions data product (Vulcan) to a national averaging of the Vulcan result. This comparison is performed for light- and heavy-duty vehicle classes, and rural and urban road groups. We find that the use of national averages incurs state-level biases for road groupings that are almost twice as large as for vehicle groupings. The uncertainty for all groups exceeds the bias, and both quantities are positively correlated with total state emissions. States with the largest emissions totals are typically similar to one another in terms of emissions fraction distribution across road and vehicle groups, while smaller-emitting states have a wider range of variation in all groups. State-specific errors in reduction estimates as large as ±60% corresponding to ±0.2 MtC are found for a national-average emissions mitigation strategy focused on a 10% emissions reduction from a single vehicle class, such as passenger gas vehicles or heavy diesel trucks. These differences highlight the importance of spatial resolution for achieving consistently effective emissions reductions. Climate agreements that fully account for uncertainties in emission estimates as well as regional differences will be best suited to enact effective policy.

Session 4: Tools Leveraging Technology

Chairs: Sally Dombrowski, US EPA
Madeleine Strum, US EPA

8:30 **"**SLEIS – A Shared Emissions Inventory Management Tool**"**, B. Betterton and D. Porter, West Virginia Department of Environmental Protection, Charleston, WV; B. Smith, Windsor Solutions, Inc

The State and Local Emissions Inventory System (SLEIS) allows permitted facilities to submit point source emissions inventory data and related meta-data to state and local agencies via a Web-based, CROMERR-compliant reporting system. SLEIS positions organizations to better manage and review collected data, including the quality assurance of emissions inventory data submitted by regulated entities. SLEIS also includes an Exchange Network interface to manage the generation and submission of XML files to U.S. EPA's Emissions Inventory System (EIS).

SLEIS has been designed and developed by a consortium of state and local environmental agencies with shared needs for emissions inventory development. By combining resources and collaborating throughout the software development process, the consortium has been able to deliver a shareable emissions inventory data management system that is an extremely powerful and yet cost-effective solution for the partner organizations.

We will discuss how SLEIS enables the regulated community to meet reporting obligations by providing a secure, intuitive, and streamlined interface for the submission of facility inventory and emissions data and meta-data.

We will also explain how SLEIS brings much greater efficiency to the collection, processing, analysis, and quality assurance of emissions inventories for the consortium partners, while allowing each member of the consortium with the ability to configure the system to meet their own unique needs.

This innovative, cost-sharing project has streamlined and enhanced the emissions inventory development process for both point sources and the agencies.

8:55 "Experiences Conducting Port Emission Inventories in Canada", J. Lindner and B. McEwen, SNC-Lavalin Environment

Transport Canada (TC) and SNC-Lavalin Environment (SLE) have developed a Ports Emissions Model for the preparation of port emission inventories (EIs) in Canada. This user-friendly MS Access-based tool allows terminals, port authorities and government agencies to reliably estimate the emissions associated with port activities from marine trade. The activities of 5 sources are captured: admin, cargo-handling equipment, on-road vehicles, marine and rail. Emission factors are sourced from EPA models such as MOBILE and NONROAD as well as emissions test data for rail (and non-conventional or hybridized equipment). The TC Ports Model is the actualization of the TC Ports Protocol, which details how to conduct inventories consistently across different regions and geographical boundaries.

The first comprehensive activity-based port EI in Canada was completed for Port Metro Vancouver (PMV) for the 2005 inventory year. Similar inventories have since been completed for the Ports of Montreal, Hamilton, Sept-Îles and Halifax. SLE recently completed the updated 2010 inventory for PMV which now includes the activity of over 115 terminals spread across the Lower Fraser Valley. TC and SLE are using this tool to complete a 2010 baseline inventory for all 18 Canadian Port Authorities. The 2010 baseline will benefit from a 2010 national marine inventory currently being finalized by SLE and Environment Canada.

This paper shares the experiences gained conducting port inventories in Canada, the evolution of methodologies and how these lessons can be applied to other port jurisdictions to improve our understanding of port activities, marine trade and the associated emissions.

9:20 "Toxics Release Inventory Data and Tools", S. Witkin, US EPA

This paper will answer two main questions: What does the Toxics Release Inventory (TRI) offer to a data user today? And Why a user discouraged by previous limitation may want to take a new look at TRI. This inventory is mandated by the Emergency Planning and Community Right-to-Know Act (EPCRA) and is to inform communities and citizens of chemical hazards. The TRI is publicly available and containing information on toxic chemical releases, transfers and waste management activities on nearly 700 chemical. Data is submitted annually becomes available starting seven months after the close of the reporting cycle. The database is made available through several dissemination points including Envirofacts, TRI Explorer, and TRI.NET to name a few. Envirofacts is EPA's primary data warehouse containing powerful query capability. TRI Explorer provides quick access to the TRI data in an easy to use and understand format. TRI.NET is a high performance data engine for querying TRI data. This highly interactive tool has a number of advanced query capabilities using ad hoc queries and mapping technologies. TRI.NET features several value added data layers including Tribal Lands, US/Mexico Border and Environmental Justice. The TRI data set is continually growing to add more data and linkages to other datasets. Internal enhancement such as implementation of an Extract, Transform, and Load tool will bring faster availability of the data with improve overall data quality. Several new projects to enhance the availability and usefulness of the TRI data are currently underway and are discussed in more detail.

9:45 "New Features for the Emissions Inventory System (EIS)", J. Miller, R. Ryan and S. Dombrowski, US EPA

Although it is still a "young" system, EIS has proven to be an invaluable tool in compiling and assessing emission inventories. Since it began allowing the submission of data from Tribal, state, and local agencies in July of 2010, EIS has been adding features to enhance data quality, ease of use, and retrieval features to improve the system. This paper will outline recent enhancements as well as future planned enhancements that will improve the quality and accessibility of data throughout the EIS application.

10:10 **BREAK**

10:40 "Integrating GHGs into NCDAQ's Air Emissions Reporting Online (AERO) as a Tool for State Planning", T. Manning, S. Masemore and P. Hemmer, NCDENR, Division of Air Quality

With emerging scientific evidence of the global and national impacts of greenhouse gases (GHGs), NC Division of Air Quality (NC DAQ) began the planning process toward the study of NC's contribution to this issue. In order to assess this contribution and to analyze the impact of federal regulations, NC DAQ incorporated GHGs into its electronic emission inventory reporting system, data reports and combustion emission calculation spreadsheets. All pollutants classified as GHGs were added to the pollutant list in NC's web-based emissions reporting system called the Air Emissions Reporting Online (AERO). Beginning with the reporting of calendar year (CY) 2007 emissions, facilities could voluntarily report GHGs at the same time that criteria and hazardous air pollutants were reported. Since the majority of NC's GHG emissions are emitted from combustion sources, the emission factors were added to combustion calculation spreadsheets and GHG reporting guidelines were provided on NC DAQ's web page for use by facilities. These calculation spreadsheets and guidance documents were updated when the federal GHG Mandatory Reporting Rule (MRR) was promulgated. Outreach to encourage voluntary reporting of GHGs was provided through on-site workshops and on-line webinars.

NC DAQ is using the GHG emissions data collected since CY2007 to assess what industries are contributing to the GHG issue, where those industries are located and how they are regulated by recent federal permitting rules. These GHG emissions data, along with the US Environmental Protection Agency (EPA) GHG data collected through the GHG MRR, are planned to be combined and made available to the public interested in further analysis.

11:05 "SANGEA 4.0 – Facilitating Standardization of Greenhouse Gas Emissions Quantification for the Petroleum Industry", H.-M Sung, Trinity Consultants, Inc and A. Adefemi, American Petroleum Institute, Washington, DC

Since the early 2000's, the American Petroleum Institute (API) has supported SANGEATM as the standardized tool for petroleum energy companies to quantify greenhouse gas (GHG) emissions. Many large oil and gas companies have applied the spreadsheet-based tool for corporate GHG reporting requirements. In 2009, API published the updated Compendium 2009 with current industry best practices for estimating GHG emissions and the U.S. Environmental Protection Agency (USEPA) promulgated the Mandatory Reporting Rule (MRR) for GHG emissions for all industrial sources. In support of petroleum industry reporting efforts, API sponsored the development of the new SANGEA (Version 4) with new calculation methodologies and requirements. SANGEA-4 includes the GHG calculation methodologies from both Compendium 2009 and related USEPA MRR subparts.

SANGEA-4 is a desktop database program with a user-friendly interface that can be used to manage various types of sources throughout a large entity for corporate and/or USEPA MRR reporting requirements. SANGEA-4 provides calculation methodologies in various modules that are grouped based on API Compendium 2009 and corresponding USEPA MRR subparts. To standardize the calculation methods, input data for each source category are programmed with equations and associate emission factors published by both protocols.

This paper provides an overview of SANGEA-4 functions and features that can streamline reporting and recordkeeping processes. Examples, including emissions calculations based on both methods required by USEPA MRR and API Compendium, are presented to demonstrate how a company with both U.S. and international operations can apply the new software for multi-protocol reporting.

11:30 **Open Discussion:** An open discussion with the audience on problems encountered in using EIS; suggested enhancements; and how we can work better in the future to improve the National Emission Inventory

11:55 **LUNCH**

Session 5: Stationary/Nonpoint/Area Sources

Chairs: Lynn Barnes, SC DHEC
Roy Huntley, US EPA

8:30 "A Detailed Approach for Improving Continuous Emissions Monitoring Data for Regulatory Air Quality Modeling", Z. Adelman, M. Omary, Q. He, J. Zhao and D. Yang, Institute for the Environment, UNC, NC; J. Boylan, Environmental Protection Division, Atlanta, GA

Under Part 75 of Volume 40 in the Code of Federal Regulations, continuous emissions monitoring (CEM) and reporting is required for large electricity generating units and industrial facilities. Some units are required to report hourly emissions year-round, while other units are only required to report hourly emissions for part of the year. To satisfy the Part 75 requirement that CEM data are reported for every operating hour at units that are required to report emissions, a complex process for reporting and filling in missing data has been defined. Many times, missing emissions are substituted with values that are much larger than the actual emissions that were emitted. In order to properly deal with the issues described above, three steps must be followed to correctly simulate the emissions from these sources.

1. Anomalous data points in the CEM database that resulted from the Part 75 substitution methodology must be identified and corrected.
2. Differences between the reported CEM emissions and annual emissions estimates reported by the states for the CEM units must be reconciled and simulated accordingly
3. Hourly emissions for the non-reporting periods need to be generated.

This presentation describes a methodology to complete these three steps and improve the CEM atabase for conducting regulatory air quality modeling. Analysis and data augmentation utilities were developed to implement these steps in a systematic and reproducible approach. Details of these utilities, the algorithms and equations used to improve the CEM data, and results for several CEM units in the Southeastern U.S. are presented.

8:55 "Improvement of Residential Wood Combustion Emissions in Southeastern US", B-Uk Kim, GA Environmental Protection Division; T. Anderson, Alabama Department of Environmental Management; J. V. Bruggen and A. Bolman, Corporation

The Southeastern Modeling, Analysis, and Planning (SEMAP) project is continuing the efforts of ten states in the southeastern U.S. to address the next phase of ozone, fine particle, and regional haze assessment obligations required by the Clean Air Act. As part of the SEMAP project, emissions from residential wood combustion were initially estimated with U.S. Environmental Protection Agency's Residential Wood Combustion (RWC) Tool. After reviewing the preliminary results with GIS tools and other published information, however, SEMAP states decided to revise the underlying input data to better reflect local characteristics. Two major components revised in this study were the number of wood-burning appliances and cords of wood burned per appliance. To incorporate these input changes into the

RWC Tool, wood-burning appliance profiles and burn rate profiles were updated, and a series of decision algorithms were developed to assign revised profiles to each county in the SEMAP region. The revised RWC Tool resulted in the following SEMAP region-wide reductions of emissions compared with the preliminary estimates with original RWC Tool inputs: 74 % reduction in NOx, 62 % reduction in VOCs, and 59 % reduction in primary PM2.5. The resulting estimates are considered to more closely reflect actual southeastern U.S. RWC emissions. This paper describes details of the methodology, results, and conclusions, as well as recommendations for future work.

9:20 "Standardized Emissions Inventory Methodology for Open Pit Mining Areas", J. I. Huertas, D. A. Camacho and M. E. Huertas, Automotive Engineering Research Center – CIMA, Toluca, Mexico

There is still interest in a unified methodology to quantify the mass of particulate material emitted into the atmosphere by activities inherent to open pit mining. For the case of Total Suspended Particles (TSP), the current practice is to estimate such emissions by developing inventories based on the emission factors recommended by the USEPA for this purpose. However, there are disputes over the specific emission factors that must be used for each activity and the applicability of such factors to cases quite different to the ones under which they were obtained. There is also a need for particulate matter with an aerodynamic diameter less than 10 µm (PM_{10}) emission inventories and for metrics to evaluate the emission control programs implemented by open pit mines.

To address these needs, work was carried out to establish a standardized TSP and PM_{10} emission inventory methodology for open pit mining areas. The proposed methodology was applied to 7 of the 8 mining companies operating in the northern part of Colombia, home to the one of the world's largest open pit coal mining operations (~70 Mt/year). The results obtained show that transport on unpaved roads is the mining activity that generates most of the emissions and that the total emissions may be reduced by up to 72% by spraying water on the unpaved roads. Performance metrics were defined for the emission control programs implemented by mining companies. It was found that coal open pit mines are emitting 0.726 and 0.180 kg of TSP and PM_{10}, respectively, per Mg of coal produced. It was also found that these mines are using on average 1.148 m^2 of land per Mg of coal produced per year.

9:45 "A Procedure for Estimating Nonpoint Source Air Pollutant Emissions from Industrial, Commercial and Institutional Fuel Combustion", A. Bollman, J. G. Dorn and F. Divita, Jr.,TranSystemss │E.H. Pechan and R. Huntley, US EPA

The purpose of this paper is to provide documentation of a methodology to assist State, Local, and Tribal agencies in estimating nonpoint source emissions from Industrial, Commercial, and Institutional (ICI) fuel combustion for the 2011 National Emission Inventory. Fuels considered include coal, distillate oil, natural gas, liquefied petroleum gas, kerosene and wood. One of the key data sources for this methodology is total state-level ICI energy consumption data released annually as part of the Energy Information Administration's State Energy Data System (SEDS). This paper describes fuel-specific activity data adjustments that must be made to the SEDS data to account for the fraction of energy consumed for non-fuel combustion activities (e.g., energy used as product feedstocks), as well as the portion of SEDS fuel consumption associated with sources whose emissions are included in the nonroad inventory. Procedures for allocating state-level data to counties, and a nonpoint source to point source category crosswalk for use in performing point source activity subtractions will also be discussed.

10:10 **BREAK**

10:40 "EPA's PM Augmentation Procedure", R. Huntley, US EPA; J. Dorn and S. Colodner, TranSystems │E.H. Pechan,

The development of State Implementation Plans (SIPs) to demonstrate compliance with the 8-hour ozone National Ambient Air Quality Standard (NAAQS), the particulate matter $(PM)_{2.5}$ NAAQS , and the Regional Haze Rule, requires that state, local, and tribal agencies (SLT) have access to accurate emissions inventories. The $PM_{2.5}$ NAAQS and the Regional Haze Rule emphasize emission inventory development for the PM species required in regional air quality modeling. Submission of PM emissions to EPA's National Emissions Inventory (NEI) by SLT agencies should include filterable and primary PM (PM10-PRI, PM10-FIL, PM25-PRI, and PM25-FIL) along with condensible PM (PM-CON). Augmentation of the PM species in the 2008 NEI point source inventory is necessary to ensure completeness of the PM inventories and to ensure that SLT inventories do not contain erroneous pollutant reporting. This paper explains the procedures developed to correct reporting inconsistencies and to populate missing PM species in the NEI.

In general, emissions for PM species missing from SLT inventories were estimated using PM emissions data supplied by SLT agencies, conversion factors described in Strait et al. (1999), and factors derived from Microsoft Access® databases that serve as a replacement for the PM Calculator historically used by EPA. One limitation is that the Access® databases do not contain information on condensible emissions; however, in cases where condensible emissions are not reported, conversion factors developed by Strait et al. (1999) are applied to SLT reported PM species or species derived from the PM Calculator databases.

11:05 "Estimates of Emissions from Coal Fired Thermal Power Plants in India", M. Mittal, University of South Florida and C. Shama and R. Singh, Radio and Atmospheric Sciences Division, New Delhi

Coal is the primary fuel for electricity generation in India and its usage is continuously increasing to meet the energy demands of the country. This paper presents emissions of carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitric oxide (NO) from thermal power plants in India for a period of nine years from 2001-02 to 2009-10. The emission estimates are based on a model in which the mass emission factors are theoretically calculated using the basic principles of combustion and operating conditions. Future emission scenarios for the period up to 2020-21 are generated based on the estimates of the nine years from 2001-02 to 2009-10. Power plants in India use different qualities of coal, different combustion technologies and operating conditions. As a result, these plants have differences in achieved efficiencies (coal usage per unit of electricity). The estimates show region wise differences in total emissions as well as differences in emissions per unit of electricity. Computed estimates show the total CO_2 emissions from thermal power plants have increased from 323474.85 Gg for the year 2001-02 to 498655.78 Gg in 2009-10. SO_2 emissions increased from 2519.93 Gg in 2001-02 to 3840.44 Gg in 2009-10, while NO emissions increased from 1502.07 Gg to 2314.95 Gg during this period. The emissions per unit of electricity are estimated to be in the range of 0.91 to 0.95 kg/kWh for CO_2, 6.94 to 7.20 g/kWh for $SO_{2,}$ and 4.22 to 4.38 g/kWh for NO during the period 2001-02 to 2009-10. The future emission scenario, based on the projected coal consumption in Indian thermal power plants by Planning Commission of India under 'Business-as Usual (BAU)' and "Best case Scenario (BCS)' show the emission in the range of 714976 to 914680 Gg CO_2, 4734 to 6051 Gg SO_2 and 366 to 469 Gg NO in the year 2020-21. Increase in coal use efficiencies in electricity generation by thermal power plants can significantly reduce the emissions of greenhouse and polluting gases. This methodology provides a useful tool for inventory preparation in a sector where measured values for emissions factors are very sparse.

11:30 "Fugitive Emissions from a Dry Coal Fly Ash Storage Pile", S. F. Mueller, Q. Mao, R. Valente and J. Mallard, Tennessee Valley Authority and S. L. Shaw, Electric Power Research Institute

Standardized estimates of fugitive emissions resulting from bulk materials handling are subject to many potential uncertainties based on the material of interest, the specifics of operational handling, and local geography and meteorology. In 2011 EPRI undertook the first of 3 phases of a field monitoring study at a power plant that investigated fugitive emissions of $PM_{2.5}$ and $PM_{10\text{-}2.5}$ ("PM_c" for short) from a large dry storage coal fly ash pile. The results incorporated ambient measurements from May to October of 2011, statistical analyses of meteorological data, use of dispersion modeling to calculate emission factors, and a comparison to AP-42 approaches. Specifically, hourly $PM_{2.5}$ and PM_{10} data from beta attenuation monitors (BAMs) was combined with high frequency measurements of light scattering (b_{scat}) to make measurements of background concentrations as well as two sites downwind of a dry fly ash pile at a large coal-fired power plant. Activities monitored on the dry stack included hauling, dumping, and grading. In addition, an unpaved road exists along the base of the dry stack on top of a berm to stabilize the stack. This road is a source of vehicle-generated fugitive dust, and methods were developed to separate out the contribution from the fly ash emissions signal. The results suggest $PM_{2.5}$ and PM_c emission factors for both fly ash and road dust that are considerably lower than those based on AP-42 methods. Planned future work includes similar studies of coal and limestone/gypsum materials.

11:55 **LUNCH**

Session 6: Oil & Gas Exploration and Production Emissions

Chairs: Tom Moore, WRAP
Regi Oommen, ERG

8:30 "Condensate Tank Emissions", D. Wells, Colorado APCD

There is evidence that oil and gas (O&G) volatile organic compound (VOC) emissions in northeastern Colorado are underestimated. The largest O&G source category in the Denver Metro Area & North Front Range 8-hour Ozone Nonattainment Area is condensate tanks. These are the tanks where the condensate is dumped after it comes out of the ground. We have evidence from observations, ambient monitors and inverse photochemical modeling that condensate tanks leak. Most of the emissions are from "flash" events (the sudden release of gas from solution). This occurs when pressurized condensate is dumped into the tank. To account for theses leaks, we assumed 75% of the emissions are sent to a flare for the purposes of our recent modeling exercise.

Calculation of controlled emissions (emissions after the control that go to the environment) can be presented as follows:

Controlled Emissions = Uncontrolled Emissions x (1 - Control Device Efficiency x Rule Effectiveness x Capture Efficiency).

The control device is a flare of 95% efficiency. Rule effectiveness is a measure of how well the rule is enforced. We are using 83%. Capture efficiency is the fraction of emissions going to the control device.

The formula therefore becomes: Controlled Emissions = Uncontrolled Emissions x (1-0.95 x 0.83 x 0.75).

Controlled emissions increase by a factor of eight but because all condensate tanks are not controlled, overall emissions increase by a factor of about three. Applying the resulting inventory in a photochemical model improved results over earlier models when compared to monitored observations.

8:55 "Estimation of Emissions from Oil and Natural Gas Operations in Northeastern Colorado", G. Pétron, G. J. Frost, B. R. Miller, J. Kofler, A. Karion and C. Swenney, Cooperative Institute for Research in Environmental Sciences, University of Colorado; S. A. Montzka, A. E. Andrews, E. Dlugokencky, M. Trainer and P. Tans, National Oceanic & Atmospheric Administration, Earth System Research Laboratory, Global Monitoring Division

We present top-down VOC and CH_4 emission evaluation results from a pilot study conducted in the Denver-Julesburg fossil fuel Basin (DJB) in northeastern Colorado [Pétron et al, 2012]. We have used in-situ and canister data collected from a 300-m tall tower located in the DJB and an instrumented vehicle. Our analysis suggests that the emissions of the measured species are most likely underestimated in current inventories.

9:20 "A Comprehensive Emissions Inventory of Upstream Oil and Gas Activities in the Rocky Mountain States", A. Bar-Ilan, J. Grant, R. Parikh and R. Morris, ENVIRON International Corporation, Novato, CA; K. Sgamma, Western Energy Alliance, Denver, CO; T. Moore and L. Gribovicz, Western Governors Association, Denver, CO

The Western Energy Alliance (WEA, formerly the Independent Petroleum Association of Mountain States) and the Western Governor's Association's Western Regional Air Partnership (WRAP) have co-sponsored a project to develop detailed emissions inventories for oil and gas upstream exploration and production activities. These inventories cover the Rocky Mountain States in the U.S., including New Mexico, Colorado, Utah, Wyoming and Montana. These inventories, conducted on the geological basin level, are the most comprehensive oil and gas emissions inventories to date in this region; they include all major processes and equipment types, from initial drilling through completion, production and processing activities in the major oil and gas fields of the Intermountain West. The inventories were developed by compiling detailed survey data collected from the major oil and gas companies, and include criteria pollutant emissions of NOx, VOC, CO, SOx and PM considering a base year of 2006 with future year projections for 2012. The basin-level inventories have been completed for the Wyoming basins, including an initial effort to conduct triennial updates to calendar year 2009, with anticipated regular triennial updates for all basins. The Wyoming basins, including baseline 2006 and projected 2012/2015 inventories, incorporate extensive analysis of permitted data, as well as the impacts of state regulatory controls. The inventory updates are also presented, showing rapidly evolving trends between 2006 and 2009. Finally, an analysis has been conducted to evaluate the impacts of recently passed national EPA regulations to implement controls on specific oil and gas source categories, as well as additional reporting requirements for tribal land.

9:45 "The Development of Oil and Gas Production Site and Midstream Facility Emissions Inventories in Wyoming", B. R. Bohlmann and B. R. Hall, Wyoming Department of Environmental Quality

The Wyoming Department of Environmental Quality (WDEQ) Air Quality Division's (AQD's) staff is continuing the process of developing and improving oil and gas minor source emission inventories for production sites and midstream facilities in Wyoming. This process includes: the refinement of the Microsoft Excel© inventory workbooks developed by AQD staff for each source at production and midstream oil and gas facilities; generating tank flashing emission equations; developing and populating data systems; and reporting emissions to the U.S. Environmental Protection Agency (EPA).

Excel workbooks developed by the AQD staff are provided to the operators for reporting actual emissions from production and midstream facilities back to the AQD. Where possible, equations have been programmed into the individual worksheets within the Excel workbooks to aid operators in completing the inventories.

The process for generating storage tank flashing equations involves requesting operators to supply extended hydrocarbon analyses, generating field-wide oil and gas analyses by AQD staff from the operator submitted hydrocarbon analyses, and then creating the field and formation specific tank flashing equations.

Developing and populating data systems, involved the creation of the Oil and Gas Emissions Reporting (OGER) data system which stores production and actual air emissions data on a well-by-well and source-by-source basis. The process of uploading production site emissions data to the OGER system, entering oil and gas midstream emissions data into the Wyoming Inventory System of Emissions (WISE) data system, and the current development of the Inventory, Monitoring, Permitting, and Compliance Tracking (IMPACT) database will minimize the number of databases in use.

Finally, reporting emissions to EPA consists of submitting data from the OGER data system over the exchange node network to EPA's Emissions Inventory System (EIS) as county wide area sources, and the submittal of the emissions data from the WISE data system through EPA's exchange node network to EPA's EIS as point sources.

10:10 **BREAK**

10:40 "Emissions Inventory & Ambient Air Monitoring of Natural Gas Production in the Fayetteville Shale Region", D. Lyon, Environmental Defense Fund, TX and T. Chu, Arkansas Department of Environmental Quality, AR

Natural gas production in the Fayetteville Shale region of north central Arkansas has grown rapidly since horizontal drilling and hydraulic fracturing began in 2004. Arkansas Department of Environmental Quality received a grant from U.S. Environmental Protection Agency to develop an emissions inventory for gas production activities in the Fayetteville Shale for the year 2008, coupled with ambient air monitoring around gas sites.

Annual emissions from gas production in the Fayetteville Shale were estimated to be 5,002 tons nitrogen oxides (NOX), 977 tons volatile organic compounds (VOC), 674 tons particulate matter $\leq$ 10 µm (PM10), 3,377 tons carbon monoxide (CO), 128 tons sulfur dioxide (SO2), 112,877 tons methane (CH4), and 1,225,643 tons carbon dioxide (CO2). Compressor station engines used for gathering and transporting gas were the largest source of NOX, VOC, CO, SO2, and CO2 emissions. Drilling rigs and hydraulic fracturing pumps used in well drilling and completion were the largest source of PM10 emissions. Well flowback venting and fugitive sources were the primary source of CH4 emissions.

Ambient air monitoring was performed around the perimeter of six drilling sites, three hydraulic fracturing sites, four compressor stations, and one control site. Although most pollutant concentrations were below detection limits, VOC concentrations at drilling sites were often elevated around site perimeters with average daily concentrations reaching 678 parts per billion (ppb). The spatiotemporal distribution of VOC concentrations at drilling sites was significantly affected by wind direction and suggests open tanks of oil-based drilling mud and cuttings were the source of VOC emissions.

11:05 “Fort Worth Natural Gas Air Quality Study”, M. Pring, R. Oommen and J. Wilhelmi, Eastern Research Group, NC

Natural gas production has increased significantly across the U.S. recently due to advances in drilling and extraction technology. One such technology, hydraulic fracturing, has been used extensively in and around the City of Fort Worth, Texas, where natural gas extraction in urban areas is prevalent. In March 2010, the City commissioned an Air Quality Committee to design a study to address air quality impacts associated with this activity. This year-long study was comprised of four tasks - ambient air monitoring to measure air pollution levels near active well pads, natural gas compressor stations, and natural gas well hydraulic fracturing activities; point source testing to measure the pollutants emitted from these sites; air dispersion modeling conducted to estimate downwind impacts from these activities; and a public health evaluation of the study’s findings.

Ambient air monitoring for nearly 140 pollutants was conducted at 8 locations over a 2-month period, and point source testing was conducted at nearly 400 sites over a 4-month period. The results of the point source testing were used to conduct air dispersion modeling to estimate air pollutant impacts resulting directly from natural gas exploration and production activities. The ambient air monitoring and air dispersion modeling data were then compared to both short and long-term health-based screening levels. These comparisons were used to provide the City of Fort Worth with feedback on the adequacy of their existing setback provisions, which limit how close natural gas well pads and compressor stations may be to residences and other publically accessible locations.

11:30 **OIL AND GAS PANEL -** Oil and natural gas (ONG) activities in the United States have increased dramatically in the past few years across the country, both in terms of quantity and geographic coverage, This exploration and production activity increase is occurring in both existing and new basins. The proportions of gas to liquids production, and associated emissions, vary across the country by basin and by the drilling and production practices of the producers. It is estimated that ONG activities are now occurring in 30 of the 50 states. Part of this boom has been the application of a relatively new technology called hydraulic fracturing. In this panel discussion, representatives from EPA and affected states will be discussing issues, challenges, and successes pertaining to ONG activities

11:55 **LUNCH**

Session 7: GIS Innovative Methods Remote Sensing

Chairs: Steve Reid, Sonoma Technology
BH Baek, UNC

1:00 “Advancing Emissions Quantification Techniques through the NASA AQAST Program”, D. Streets, Argonne National Laboratory, IL

In many parts of the world and for many chemical species, emission inventories are not as reliable as we would like. Now that satellites can detect pollution over wide areas with daily resolution, the question arises as to whether the connection between facility or area emissions and satellite retrievals is robust enough to enable the retrievals to be used to infer emissions. This is one topic to be addressed by NASA’s new Air Quality Applied Sciences Team (AQAST), a group of researchers convened to address how Earth science research and tools can be applied to air quality management. Satellites now make routine observations of many species associated with atmospheric pollution (O3, NO2, SO2, CO, PM, HCHO, etc.). Studies have associated these column retrievals with bottom-up emissions, both with and without intervening model calculations of column amounts. The Ozone Monitoring Instrument (OMI) on the Aura satellite provides one of the most widely used retrievals. Studies of strong emitting sources around the world have revealed great potential for aiding the characterization of NO2 and SO2 emissions. A number of other applications may prove valuable: problematic industrial complexes, uncertain area sources (including biogenic), verification of regional emission reductions, quantification of uncertain Mexican and Canadian (and global) emissions and their importance for pollution import to the U.S., etc. Initially, AQAST will draw together researchers and EPA staff to review existing studies and capabilities and assess their potential use in air quality management, ultimately focusing on development needs for the most promising research directions.

1:25 "Predicators of Measurements Accuracy in the Remote Sensing of CO_2 Emissions", D. Winters, RTI International, RTP, NC

Remote sensing confers several advantages over ground-based measurements that make it an important tool for developing CO2 emissions inventories. Anthropogenic CO2 monitoring requires a high degree of accuracy in order to detect changes against the natural background variations of CO2. While studies indicate that some satellites already have this level of CO2 measurement accuracy, it is unclear what instrument properties might be responsible. Satellite instruments have been designed with a wide variety of spatial, temporal, and spectral resolutions depending on their original mission objectives, and any one or more of these properties might allow for a high CO2 measurement accuracy. The goal of this work was to determine whether any instrument properties might be good predictors of CO2 measurement accuracy, since this information would be useful for the design of future satellite instruments for monitoring CO2 emissions. The instrument properties of 25 current and planned satellite missions up to 2020 were compiled, alongside studies demonstrating the CO2 measurement accuracy of these instruments. Using multiple linear regression models, the combination of spatial resolution and swath width was found to be a significant predictor of CO2 measurement accuracy. The most accurate satellite instruments are also described, as well as suggestions for improving existing CO2 emissions inventories by combining their data with ground measurements.

1:50 "Evaluating NOx Emissions Using Satellite Observations", M. Trainer and T. Ryerson, OAA/ESRL/CSD, Boulder Colorado; G. Frost, Si-W. Kim, J. Brioude, E. Yu Hsie, W. Angevine, J. Peischl and F. Fehsenfeld, NOAA/ESRL/CSD, Boulder and University of Colorado/CIRE, Boulder; S.-H. Lee, Alamos National Laboratory, Los Alamos, New Mexico; C. Grainer, University of Colorado/CIRES, Boulder; Université Pierre et Marie Curie, CNRS/INSU, LATMOS-IPSL Paris, France; Max Planck Institute for Meteorology, Hamburg, Germany; A. Heckel, A. Hilboll, A. Richter, J. Burrows, IEP/IRS, University of Bremen, Germany; J. Gleason, Goddard Space Flight Center, NASA, Maryland and F. Boersma, Royal Netherlands Meteorological Institute (KNMI), The Netherlands

Atmospheric NO2 columns retrieved from satellites provide a useful top-down constraint on bottom-up NOx emissions inventories. We present three case studies of an approach to evaluate NOx emissions at a sector level by comparing satellite retrievals to regional chemical-transport model calculations of NO2 columns. In the first example, the atmospheric impact of implementing NOx controls at eastern US power plants is demonstrated [Kim et al., 2006]. In the second study, we use NOx monitors at western US power plants to calibrate our satellite-model comparisons [Kim et al., 2009]. We then apply our approach to evaluate bottom-up estimates of NOx emissions from western US cities. In the third example, we validate our satellite-model approach using in-situ aircraft measurements and assess NOx emissions from power plants, cities, industrial facilities, and ports in eastern Texas [Kim et al., 2011].

2:15 "Why Emission Factors Don't Work at Refineries and What to do about it", A. Cuclis, Houston Advanced Research Center

A number of studies in the U.S., Canada and Europe have found that reported emissions of volatile organic compounds (VOCs) at refineries and chemical plants are substantially lower than the measured emissions. In several cases, the reported emissions were an order of magnitude or more lower than the measured emissions. One of the main flaws of emissions reporting is that emission factors and other emissions estimating techniques assume equipment is "well-maintained". However, process equipment can have failures due to operator error, faulty design or maintenance that was performed incorrectly or not at all. In order to capture these errors, measurements are required; however, total vapor analyzers (TVAs) or "sniffers" typically used in Leak Detection and Repair (LDAR) programs only measure one point in space. Techniques such as Differential Absorption Light Detection and Ranging (DIAL) and Solar Occultation Flux (SOF) measure the VOC concentrations in a two dimensional vertical plane and calculate VOC flux in pounds per hour. The results determine the total VOC mass released. The National Institute of Science and Technology (NIST) has chosen to develop a DIAL system to measure and verify reductions in greenhouse gases that may be used in off-sets, carbon trading, a carbon tax or other exchange since there are concerns that the emission estimating techniques for greenhouse gases have similar problems. This paper provides a list of studies where measured VOC emissions were found to be substantially higher than reported values and how Sweden is using DIAL and SOF in place of emission factors and emission estimates. Additional information is provided on which parts of the petrochemical facilities are most responsible for low emission estimates and how the U.S. could benefit from the Swedish model as well as some of the obstacles.

2:40 **BREAK**

3:10 "Continuous GHG Monitoring at Local to Statewide Scales", W. Callahan, E. Novakovskaia and C. Sloop, Earth Networks, Inc

Communities and infrastructure exposed to higher than normal ambient concentrations can only be seen through continuous monitoring of near-surface conditions. These atmospheric observations are also an essential piece of information, which enables agencies and businesses to prepare for oncoming events and to respond in a timely manner. Equally important is the knowledge of how anthropogenic activities are linked to frequency and duration of anomalies in the ambient air, their change over time, and how often it is necessary to update the inventories. Over the next five years, Earth Networks will deploy 100 cavity ring-down spectrometers (CRDS) continuously measuring CO2, CH4 and H2O. It is planned to place sensors at 50 tall towers in the United States (20 instruments already deployed), plus 25 in Europe and 25 around the world. Data from this network will be used for inverse receptor-oriented modeling to estimate natural and anthropogenic sources and sinks of CO2 and CH4. Instruments are calibrated using a standard gas mixture from NOAA (National Oceanic and Atmospheric Administration). Sampling rate of the raw data from spectrometers and collocated weather stations is at the sub-minute range, which is important both for short-duration accidents and for identification of very localized emission sources that are potentially missing in inventories, which could be at least a few weeks old. Local weather information within urban and populated areas is also critical for receptor-oriented techniques. Observations provided by more than 8,000 Earth Networks' surface weather stations are available in real-time and used in our GHG monitoring system.

3:35 "Development of a Fine-Scale On-Road Mobile Source Emission Inventory for the San Francisco Bay Area", Y. Du and S. B. Reid Sonoma Technology, Inc. and P. T. Martien and V. Lau, Bay Area Air Quality Management District (BAAQMD)

Several communities in the Bay Area Air Quality Management District (the District) are developing Community Risk Reduction Plans (CRRPs) as a proactive step toward reducing exposures to toxic air contaminants and fine particulate matter. To support the development of CRRPs, Sonoma Technology, Inc. worked with the District to develop fine-scale on-road mobile source emissions inventories for six communities in the San Francisco Bay Area.

STI developed link-level inventories in a geographic information system (GIS) environment for state highways and major arterials in each community of interest for the years 2012 through 2040. The inventories were based on annual average daily traffic count data for state highways from the California Department of Transportation, traffic count data for major arterials from local transportation departments, and emission factors for each calendar year derived from the California Air Resources Board's EMFAC model. The resulting traffic activity data (which were held constant across all years) and emissions estimates (which vary by calendar year) were provided to the District as a GIS roadway network shapefile linked to a Microsoft Access database. The District incorporated this information into Rcaline dispersion modeling runs to develop their Highway Screening Analysis Tool for Risk and Hazards.

The District conducted dispersion modeling for each segment of the GIS roadway network, using separate hourly emission profiles for light-duty and heavy-duty vehicles. For each roadway segment, observed winds and other meteorological modeling inputs were selected from the nearest appropriate meteorological station. Modeled PM2.5 concentrations, cancer risk, and chronic non-cancer hazard indices for near-roadway receptor locations were compiled into an online Google Earth screening tool that allows users to estimate concentrations and risks along all major Bay Area roadways.

4:00 "An Alternative Technique to Estimate Road Traffic Emission Factors", L. C. Belalcazar, Department of Chemical and Environmental Engineering, National University of Colombia, Campus Bogota and A. Clappier, Laboratoire Image Ville Environment, France

Road traffic emission factors (EFs) are one of the main sources of uncertainties in emission inventories; it is necessary to reduce these uncertainties to manage air quality more efficiently. In this work we present a new method to estimate road traffic emission factors (EFs). The method is based on a long term tracer experiment conducted in a busy street of Ho Chi Minh City (HCMC) – Vietnam. We emitted continuously a passive tracer from a finite line source placed on one site of the street. At the same time, we measured continuously the resulting tracer concentrations at the other side of the street with a portable on-line gas chromatograph. The results of the HCMC tracer experiment were used together with traffic counts and pollutant measurements to calculate the dispersion factors and afterwards the EFs. Results show that the estimated EFs for HCMC are within the range of EFs estimated in other studies. We also used a Computational Fluid Dynamics Model (CFD) to evaluate the proposed methodology.

The evaluations show that it is possible to accurately estimate the EFs from tracer studies.

The methodology presented in this work serve for different proposes and their use can provide useful information for the air quality assessment. For example, results from the tracer study can be used to estimate the EFs under real urban conditions; it can be also used to validate near road dispersion models this in turn can be used in the future to evaluate abatement strategies.

4:25 "Biomass Burning Plume Injection Height Estimates using CALIOP, MODIS and the NASA Langley Trajectory Model", A. Soja, National Institute of Aerospace, NASA Langley Research Center; D. Fairlie, NASA LaRC; D. Westberg, Science Systems and Applications Incorporated; G. Pouliot and J. Szykman, US EPA

Historically, fire plume injection heights have been modeled based on Briggs's stack rise equations, with limited verification data. Currently, there are two instruments, Cloud-Aerosol LIdar with Orthogonal Polarization (CALIOP) (afternoon overpass) and Multi-angle Imaging SpectroRadiometer (MISR) (morning overpass), that can provide the statistics necessary to verify our assumptions and improve fire plume injection height modeling for use in both small- and large-scale models. Plume height methodology and statistics have already been established using MISR data. However, CALIPSO data have not been interrogated and will provide unique datasets that complement the MISR analyses. Together, these unique datasets will offer valuable information that moves us forward in terms of estimating the transport of fire emissions, which has applications for climate change research (black carbon in the Arctic; aerosols and clouds) and for projecting Air Quality warnings.

Specifically, Moderate Resolution Imaging Spectroradiometer (MODIS), CALIOP and the NASA Langley Research Center (LaRC) Back Trajectory Model are used to distinguish coincidence in active fires and smoke-filled air parcels. These data are used to build a database linking biomass plume injection heights to atmospheric conditions and fire behavior for the continental United States. We intend to show CALIOP plume height results, with a focus on 2006-2007 and the Tripod fire, and then compare the CALIOP results to coincident MISR overpasses.

Session 8: Mobile Sources

Chairs: Jeremy Heiken, Sierra Research
Chris Dresser, US EPA

1:00 "Emissions of Radical Precursors and Related Species from Traffic in Houston, Texas – Implications for Air Quality Modeling", B. Rappenglueck, S. Alvarez, J. Golovko, B. Czader and L. Ackerman, University of Houston; G. Lubertino, Houston-Galveston Area Council

The EPA has classified the Houston-Galveston-Brazoria region as in non-attainment for the 1-hour and the 8-hour ozone standards. This study will focus on the precursors of ozone from mobile sources in the Houston region.

Nitrous acid (HONO) and formaldehyde (HCHO) are known to be important precursors for radicals and are believed to favor ozone formation significantly. So far only scarce traffic emissions data that includes both compounds is available. However, this knowledge is needed to further refine and validate air quality modeling as well as to predict/simulate impact of these emissions on air quality. This study reports measurements of HCHO, HONO, CO, NO/NO2/NOx, peroxycarboxylic nitric anhydrides (PANs), and meteorological parameters which were performed in the immediate vicinity of a highly frequented urban highway junction in Houston. Ratios of various trace gas species are shown with respect to different environmental conditions. The observational data is compared to emission estimates from currently available mobile emissions models (MOBILE6 vs MOVES) and implications for air quality modeling are mentioned.

1:25 "Consumption Calculation of Vehicles Using OBD Data", A. Alessandrini, F. Filippi and F. Ortenzi; CTL Centre for Transport and Logistics, Rome

The European type approval procedure, based on a fixed driving cycle for all vehicles, is not representative of their real on-road usage: the driving style and its influence on consumption and emissions cannot be neglected and their real-world environmental impact is not simple to measure. The objective of this work is to develop a methodology to calculate in real-time the energy and environmental impact of spark ignition and diesel vehicles. An on-board instrumentation capable to communicate with the electronic system of the vehicle (OBD/CAN) have been developed to collect all the sensor data available (rpm, vehicle speed, engine load, lambda sensor voltage, catalyst temperature, intake airflow, pressure and temperature etc.) and use them as input for power and consumption models. The models have been applied on several vehicles and validated on a dynamometer chassis running NEDC and ARTEMIS cycles. Consumption has been measured with the CVS and with a portable emission analyzer (HORIBA OBS-1300). A calibration procedure has been also developed in which three tests on a dynamometer chassis are needed: the maximum power curves, the curve at idle and a curve at fixed rpm varying the engine load. For spark ignition engines, an additional test should be needed to calibrate a coefficient that takes into account of the enrichment during accelerator pedal gradients, but this coefficient is not much variable for different vehicles (~10). All the vehicles show a difference between measurements and models never greater than 4% so this can be an accurate methodology to calculate the power and consumption of vehicles during their real use.

1:50 "Global Health Roadmap – Quantifying Health Impacts from Transportation Policies", S. Chambliss, B. Facanha and R. Minjares, International Council on Clean Transportation

The Global Transportation Roadmap model is a tool to help policymakers worldwide identify and understand trends in the transportation sector, assess emission impacts of different policy options, and frame plans to effectively reduce emissions of both local air pollutants and greenhouse gases. The model calculates well-to-wheel emission inventories to 2050 from on-road vehicles, locomotives, passenger aircraft, and freight waterborne vessels worldwide with focus on the largest vehicle markets. The model includes a health module that translates changes in tank-to-wheel PM2.5 emissions to an estimate of premature mortalities avoided. The health module integrates exposure response risk analysis used by the World Health Organization with location specific intake fractions, which relate vehicle emission rates to levels of human exposure to harmful pollutants. Considerations of the health impact of well-to tank emissions changes are still in development. The presentation focuses on transportation and health data, the methodology used to quantify health impacts, and results. Data and methodological gaps are also highlighted.

2:15 "SMOKE-MOVES: Description and Recent Enhancements," A. Zubrow, US EPA; B. H. Baek, UNC Chapel Hill

EPA's Office of Transportation and Air Quality (OTAQ) and Office of Air Quality Planning and Standards (OAQPS) have developed an integrated system for mobile emissions, SMOKE-MOVES. The major motivations for this new system are: to closely integrate MOVES (Motor Vehicle Emission Simulator) into the emissions process, the sensitivity of many pollutants to temperature and humidity, and the computational demands for running MOVES. SMOKE-MOVES provides high spatial and temporal resolution of onroad inventories with respect to temperature, which is a key parameter with high temporal and spatial variability in most air quality modeling applications. We will present an overview of the system and will highlight recent improvements to the integrated system. In addition, we will present a brief comparison of SMOKE-MOVES with previous modeling results using MOVES

2:40 **BREAK**

3:10 "Moving MOVES – A Discussion on the Challenges of Sharing MOVES Output Data", Z. Adelman, M. Omary and B. H. Baek, Institute for the Environment, University of North Carolina, Chapel Hill, NC; J.-S. Lin and K. Stumpf, Air Division, Virginia Department of Environmental Quality, Richmond, VA; J. G. Wilkinson, Alpine Geophysics, LLC, Eugene, OR and E. Zalewsky, New York Department of Environmental Conversation, Albany, NY

Despite operational enhancements to improve processing times included in versions 2010 and 2010a of the Motor Vehicle Emissions Simulator (MOVES), computational resources remain a barrier to extending the model to cover a wider region than a subset of representative counties per state. Both the Sparse Matrix Operator Kernel Emissions (SMOKE) system and the SMOKE-MOVES Integration Tool, which prepares MOVES output data for processing with SMOKE, require additional computing and labor resources in order to prepare MOVES outputs for input to air quality models (AQM). MOVES can be run in either (1) emissions inventory mode or (2) emissions rate mode, through each mode has its own inherent set of limitations and benefits. We will explore the tradeoffs that each mode offers. Given the practical limitations of preparing and running MOVES data for AQMs, approaches are being explored to distribute the processing burden by simulating first only limited geographic areas at different modeling centers and then concatenating the results to produce a regional or national MOVES inventory. This presentation explores the strengths and weaknesses of the distributed MOVES processing between the Northeast and Southeast Regional Planning Organizations. Particular topics to be discussed include how underlying meteorology should be considered in the sharing of MOVES data and what approaches are available for interpolating MOVES results to different modeling domains. This presentation will also discuss how to best coordinate the modeling community to optimize MOVES results for both accuracy and efficiency in the modeling process.

3:35 "Using the Cloud to do Large Numbers of MOVES Runs", H. Michaels, US EPA OTAQ, MI; W. Faler, Fluid and Reason, LLC and B. Aikman, US EPA

EPA's Office of Transportation and Air Quality (OTAQ) turned to cloud computing because MOVES is computing-intensive, we have a lot of runs to do, and cloud computing provides cheap, abundant computing resources on demand. Mobile-source inventory generation is an ideal application for cloud computing, because the calculations for each geographic unit, time period, and vehicle class are independent and can therefore be run on separate computers in parallel. The challenges have been in managing large numbers of runs, tracking and recovering from errors, and integrating the results into useful output. In this paper, we describe in some detail how we use the cloud to create and post-process MOVES rate tables for eventual air quality modeling. Cloud computing vendors differ in their interfaces, so what we have done is not universal, but it provides a potentially useful picture of the processes, complexities, pitfalls, and rewards of such an effort.

4:00 "MOVES International Model Development", E. Glover, US EPA and S. Kishan, Eastern Research Group

The US EPA's MOVES Emission Factor and Inventory model is being adapted for use in an international setting. It will allow the user to model a variety of local conditions and it will accept data that has been adapted to reflect specific countries and regions. The initial version of the model will focus on light duty vehicles with the potential for additional improvement such as the inclusion of all vehicle classes.

The model will allow the user to import localized activity data, fleet characterization data, specific fuel properties, and other parameters into MOVES that closely reflect the makeup of their local fleets. The model will also contain base emission rates based on Euro, Asian and other international emission standards along with appropriate fleet penetration and implementation dates. This will allow for more accurate estimation of emission inventories and emission factors. However the model will still use its internal drive cycles, fuel effect algorithms, vehicle classes, road types, and other information which are based on data collected in the U.S.

4:25 "Development of MOVES-Mexico", H. Yang and W. W. Li, UTEP; G. Ayala, International Communities Research Center; G. Pinal, El Paso MPO and V. Valenzuela, TCEQ, Region 6

MOVES inputs were collected and processed for Ciudad Juárez, Chihuahua, Mexico in 2008. The onroad mobile source emissions were estimated using MOVES2010b. The annual total VMT is estimated to be 2.9153E+09 miles. The 2008 NOx emission is estimated to be 13625 tons, and the CO emission is 57327.24 tons. However, several critical inputs are not available or incomplete, such as the road type distribution of vehicle miles traveled (VMT) for each vehicle type and the information of fuel supply and fuel formulation.

Due to the lack of local data in Juárez, the county level emissions from 10 states in the Mid-Atlantic and Northeast region are analyzed to estimate the uncertainty range of emissions when only certain MOVES inputs are available, such as the annual VMT. There are 116 counties in the 10 states. They have been simulated in MOVES by 29 representative counties in term of emission factors, which has the same fuel, implementation and maintenance (I/M), fleet age distribution, and similar meteorology in each county group. Therefore, these 116 counties make a good sample to generate statistically significant indices. The analysis shows that the annual NOx and CO emissions are generally within a factor of 1.5 of the fitted emissions as linear function of VMT. When the annual emissions are broken down by vehicle types, NOx emissions are narrowed down to within a factor of 1.2 of the fitted values, while the fitting of CO emissions stays roughly the same as when all vehicle types are lumped together.

It is expected the methodology of processing MOVES inputs for Juárez and the quantification of uncertainty to be useful for other regions in Mexico to develop MOVES emissions. Considering many countries do not have the complete input datasets required by MOVES, the conclusions could also provide good references to the application of MOVES in other countries.

Session 9: Global/International Issues

Chairs: Zac Adelman, UNC
Rebecca Tooly, US EPA

1:00 "Anthropogenic Emissions at the Global and Regional Scale during the Past Three Decades", C. Granier, NOAA/ESRL/CSD and University of Colorado/CIRES, CO, Universite Pierre et Marie Curie, CNRS/INSU LATMOS-IPSL, France; Max Planck Institute for Meteorology, Germany; A. D'Angiola and K. Zemakova, Universite Pierre et Marie Curie, CNRS/INSU LATMOS-IPSL, France; H. D. van der Gon, TNO, Utrecht, the Netherlands; G. Frost, NOAA/ESRL/CSD and University of Colorado/CIRES, CO; G. Janssens-Maenhout, Joint Research Center, Ispra, Italy; Z. Klimont, IIASA, Laxenburg, Austria; J-F Lamarque, NCAR, Boulder, CO; A. Mieville, Laboratoire d'Aerologie, Toulouse, France and D. van Vuuren, Netherlands Environmental Assessment Agency, Bilthoven, the Netherlands

The paper presents a comparison and evaluation of different emissions datasets concerning global and regional anthropogenic emissions, focusing on their trends over the 1980-2010 period. This period was chosen because most of the inventories currently available cover at least partially these three decades. We also consider different sets of future scenarios. The analysis considers the following species: methane, carbon monoxide, nitrogen oxides, sulfur dioxide, black carbon and organic carbon, ammonia, and total non-methane volatile organic compounds. In this analysis, we include total global emissions as well as emissions for several regions, i.e. Europe, the USA, Canada, South America, Africa, India, China and Oceania. When possible, the emissions provided by regional agencies are included. This analysis helps identifying the species and regions for which a high degree of consistency exists about emission levels and their trends during the past three decades. It will also demonstrate the species and regions for which large uncertainties remain.

1:25 "Addressing Science and Policy Needs with Community Emissions Efforts", G. Frost, NOAA/ESRL/CSD and University of Colorado/CIRES, CO; C. Granier, NOAA/ESRL/CSD and University of Colorado/CIRES, CO, Universite Pierre et Marie Curie, CNRS/INSU LATMOS-IPSL, France; Max Planck Institute for Meteorology, Germany; L. Tarrason, Norwegian Institute for Air Research (NILU), Norway; P. Middleton, Panorama Pathways, Boulder, CO

We present community-driven emissions efforts within the Global Emissions InitiAtive (GEIA, http://www.geiacenter.org/), a joint IGAC/iLEAPS/AIMES initiative of the International Geosphere-Biosphere Programme. Since 1990, GEIA has served as a forum for the exchange of expertise and information on emissions. GEIA's mission is to

(1) quantify anthropogenic emissions and natural exchanges of trace gases and aerosols; and

(2) facilitate the use of this information by the research, assessment, and policy communities.

GEIA supports a worldwide network of over 1200 developers and users in international scientific projects, providing a solid scientific foundation for atmospheric chemistry research.

Moving forward, GEIA is broadening its role to serve the scientific, regulatory, and operational emission communities. GEIA intends to demonstrate the potential for improving emission information by promoting the interoperability of datasets and tools and by making use of near-real-time observations. As a first step toward these goals, two new programs are being linked with GEIA:

- ECCAD (Emissions of Chemical Compounds & Compilation of Ancillary Data, http://eccad.sedoo.fr/) is GEIA's new interactive emissions data portal, providing consistent access to emission inventories and ancillary data with easy-to-use tools for analysis and visualization.
- CIERA (Community Initiative for Emissions Research & Applications, http://ciera-air.org/) is a new GEIA community project to develop interoperability in emissions datasets and tools, support evaluations of inventories, communicate emissions information in innovative ways, and connect the emissions development and user communities.

We invite the scientific and policy community to join the GEIA network and build partnerships to improve emissions information.

1:50 “Bureau of Ocean Energy Management Gulf of Mexico Emissions Inventories”, H. Ensz, Bureau of Ocean Energy Management (BOEM), New Orleans, LA; D. Wilson, R. Oommen, S. Enoch and R. Billings, Eastern Research Group, NC

The Bureau of Ocean Energy Management (BOEM) Gulf of Mexico Outer Continental Shelf Regional office in New Orleans, Louisiana, has completed four air quality emission inventory projects: the *Data Quality Control and Emissions Inventories of OCS Oil and Gas Production Activities in the Breton Area of the Gulf of Mexico*; the *2000 Gulfwide Emission Inventory Study*: the *Year 2005 Gulfwide Emission Inventory Study*; and the *Year 2008 Gulfwide Emission Inventory Study.* Currently a fifth emission inventory is being developed for the Year 2011. These studies build upon past Gulf of Mexico air quality studies to assess the potential impacts of air pollutant emissions from offshore oil and gas exploration, development, and production sources in the Outer Continental Shelf (OCS). These inventories cover all OCS oil and gas production-related sources in the Gulf of Mexico, including non-platform mobile sources, for criteria pollutants and greenhouse gases. The methods to collect the monthly platform activity data, develop the platform and non-platform source emission estimates, and allocate the non-platform mobile source emission estimates throughout the OCS are discussed in detail in each study report, and the resulting emission estimates are presented and evaluated. The inventory results for 2008 indicate that OCS oil and gas production sources (as opposed to non-production sources such as commercial marine vessels and military vessels) emit the majority of air pollutants in the Gulf of Mexico on the OCS. Oil and gas production platforms emit the majority of the carbon monoxide and volatile organic compound emissions. Non-platform OCS oil and gas production sources such as support vessels and drilling vessels emit the majority of the estimated nitrogen oxides, particulate matter, and sulfur dioxide emissions. For greenhouse gases, platform sources account for almost all of the methane emissions.

2:15 “Carbon Fluxes and Greenhouse Gas Emissions from Wetland Wildland Fires in the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands”, R. Mickler, Alion Science and Technology; T. Strand, Scion Research; N. French, Michigan Technology University and S. Page, University of Leicester

At its 33rd session, the Intergovernmental Panel on Climate Change (IPCC) decided to produce additional guidance, the “2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands”, to cover both inland wetlands and coastal wetlands. The 2006 IPCC Guidelines themselves note that the guidance on wetlands is incomplete. Emissions inventory methodologies for prescribed and wildland fires were specifically identified as a knowledge gap. While the IPCC (2006) Guidelines cover CO2 and non-CO2 emissions from fires, there is only limited guidance for above-ground carbon stocks and no guidance on losses from organic soils. Compared to vegetation fires, the uncertainties of emission estimates of peat fires are high, because peat can burn repeatedly and to different depths. Furthermore, various compounds and gases can be emitted depending on the type and density of the peat. Thus not only the area, but also the depth of the fires and the type of emissions must be determined, which is only feasible in higher Tier levels. We discuss the proposed tasks which include literature search, evaluation of scientific appropriateness, development of decision trees for national methods for carbon fluxes and greenhouse gas emissions for international prescribed and wildland fires on wetlands

2:40 **BREAK**

3:10 “Spatial Distribution of Non-Exhaust Particulate Matter Emissions from Road Traffic for the City of Bogota – Columbia”, D. Beltran, L. C. Belalcazar and N. Rojas, Department of Chemical and Environmental Engineering, National University of Colombia, Campus Bogota

Non-exhaust traffic emissions are an important source of particles in cities, however, current scientific knowledge on this source of pollution is scarce. Moreover, air quality modeling studies typically doesn’t include these emissions mainly due to the difficulties associates with the estimation and the spatial distribution of such emissions for modeling.

In this work we used the US-EPA and the EEA methodologies to estimate the non-exhaust $PM_{2.5}$ and PM_{10} emissions for the city of Bogota (Colombia). These emissions included brake wear, tire wear and abrasion of paved and unpaved road surfaces. We also used traffic counts, activity data and a domain of 40x40 Km with cells of 1x1 Km to spatially distribute these emissions. The results show that near 54% of all the $PM_{2.5}$ emitted in the city comes from non-exhaust emissions (traffic exhaust emissions: 26%; industry: 20%), which agrees with results reported in other cities of the world. The results also reveal that near 80% of the non-exhaust PM emissions come from light-weight vehicles. Non-exhaust $PM_{2.5}$ and PM_{10}

emissions are higher West of the city, an area with more deteriorated roads, higher volumes of vehicles, and with the highest levels of particles concentrations in the city.

This work underlines the importance of non-exhaust particulate emissions in cities from the developing world. It also urges the environmental authorities to control this source of pollution, and encourage the scientific community to improve existing methods to estimate and validate these emissions.

3:35 "Comparison of MODIS-Derived Burned Area Algorithm with Landsat Images in Eastern Siberia, Russia", W. M. Hao, A. Petkov, B. Nordgren, R. E. Corley and S. P. Urbanski, US Forest Service, RMRS Fire Sciences Laboratory, MT

Considerable efforts were made to verify our MODIS algorithms for mapping burned areas in Siberia. We compared the MODIS-derived burned areas with the Landsat-derived burn scars over Eastern Siberia in 2002. The MODIS burned area to Landsat burned area ratio of 1.0 and the minimal standard errors of the slope and intercept of the linear regression equation clearly indicate our MODIS burned area algorithms are reliable for determining burned areas in boreal ecosystems at continental, annual scales. The algorithms are being used to map daily-burned areas at a 500 m x 500 m resolution in Northern Eurasia from 2002 to 2011. Emissions of trace gases and aerosol particles (including black carbon) from biomass burning then will be estimated with the same spatial and temporal resolution in Northern Eurasia for the same 10-year period.

4:00 "Effects of Mitigation Policies on Reducing Global PM Emissions from On-Road Vehicles", F. Yan, E. Winijkui, T. C. Bond, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign and D. G. Streets, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Decision and Information Sciences Division, Argonne National Laboratory, IL

The purpose of this work is to provide an understanding of the potential benefits of policies in addressing global and regional particulate matter (PM) emissions in the future. A dynamic model of vehicle population linked to emission characteristics, SPEW-Trend, is used to make the emission projections and policy evaluations.

Two mitigation measures, scrappage of vehicles and retrofit to advanced control technology, are explored to examine potential PM emission reductions from on-road vehicles. The simulations show that scrappage can provide more emission reduction as soon as the measure begins, while retrofit reduces more emissions in later years when very advanced technology becomes available in most regions. With the consideration of uncertainties, scrappage and retrofit reduce emissions by 22-49% and 9-23%, respectively, within 90% confidence interval under medium scenarios in the year 2030.

Thursday, August 16, 2012

Session 1: EI Preparation for Modeling

Chairs: Alison Eyth, US EPA
Wayne Boulton, RWDI

8:30 "Modeling Impact of Vehicular Conversion to CNG in Dhaka City through Uncertainty Assessment", T. Khan, Department of Engineering, Stamford University Bangladesh and Z. Wadud, Department of Civil Engineering, BUET

To control the worsening air quality from vehicles' emissions in Dhaka, government took one major policy initiative - adopting Compressed Natural Gas (CNG), as an alternative automobile fuel in order to reduce the particulate emissions. Detail economical analysis for such a wide-scale policy is important. This paper develops a model to estimate the associated health benefits following impact pathway approach. Entire Dhaka city is grid-wise distributed (10x20 grids) and respective PM2.5 emission inventory is estimated. Grid-wise changes in emissions are fed into source-receptor matrix (SRM) developed for Dhaka to obtain changes in PM2.5 concentrations. Combining this with the appropriate concentration-response functions, mortality rates and grid-wise population, the model estimates grid-wise avoided deaths or health benefits using Value-of-statistical life (VSL) approach. Associated GHG (carbon dioxide, methane) and aerosols (sulfur dioxide, black and organic carbon) exert climate impacts. Change in global emission inventory is determined and then valued using social cost of carbon (SCC). The model considers epistemic uncertainty related to its parameters throughout the estimation procedure. Vehicles' VKT, emission factors and the valuations parameters, i.e. VSL, SCC, are included within sampling-based Monte-carlo uncertainty analysis. The total health benefit is obtained as $(1304±476) million (all 2010 USD). For change in global emissions of (870,000±515,000) tons/year, the annual climate cost is about $(38±25) million due to policy. Global and local sensitivity analyses provide with the ranking of the model parameters in terms of contribution to output variability and different scenario analysis to facilitate policy maker's choice and lead to effective future research.

8:55 "Emission Inventories and Modeling Activities for the Development of Air Quality Plans in Madrid (Spain)", R. Borge, J. Lumbreras, J. Perez, D. de la Paz, M. Vedrenne and E. Rodriguez, Laboratory of Environmental Modeling, Technical University Madrid

Modeling is an essential tool for the development of emission abatement measures and air quality plans. Most often these plans are related to urban environments with high emission density and population exposure. However, air quality modeling in urban areas is a rather challenging task. As environmental standards become more stringent (e.g. European Directive 2008/50/EC), more reliable and sophisticated modeling tools are needed to simulate measures and plans that may effectively tackle air quality exceedances, common in large urban areas across Europe, particularly for NO2. This also implies that emission inventories must satisfy a number of conditions such as consistency across the spatial scales involved in the analysis, consistency with the emission inventories used for regulatory purposes and versatility to match the requirements of different air quality and emission projection models. This study reports the modeling activities carried out in Madrid (Spain) highlighting the emission inventory development and preparation as an illustrative example of the combination of models and data needed to develop a consistent air quality plan at urban level, including:

-source apportionment studies to define contributions from the continental, national, regional and local scale in order to understand to what extent local authorities can enforce meaningful abatement measures

-source apportionment studies (zeroing-out) to define contributions from different sectors and to understand the maximum feasible air quality improvement that can be achieved by reducing emissions from those sectors, thus targeting emission reduction policies to the most relevant activities

-emission scenario development reflecting the effect of such policies

9:20 “Development of a Grid-Based Emission Inventory and a Source-Receptor Model for Dhaka City”, T. Afrin, Department of Civil Engineering Stamford University Bangladesh; M. A. Ali, S. M. Rahman and Z. Wadud, Department of Civil Engineering, Bangladesh University of Engineering and Technology

Dhaka, the capital of Bangladesh, has a population density of around 20,000 per square kilometer and faces the risk of large adverse health impacts due to poor air quality, particularly high particulate matter (PM) concentration. Government decisions aimed at curbing air pollution are usually taken on ad-hoc basis, primarily due to limited capacity for analysis of options. To assess the impact of a particular pollution control strategy, it is important to predict pollutant concentration in response to the control strategy. The present study focuses on development of a grid-based emission inventory for Dhaka considering major emission sources including vehicles, brick kiln as an industrial source, and road dust; and subsequently using the emission inventory to predict PM concentration, using a grid-based source-receptor model (SRM). The SRM has been developed using an atmospheric dispersion model ATMoS-4.0. The grid-based emission inventory has been developed considering spatial and temporal (e.g., brick kilns operating only during dry season) variations in emissions. The emission inventory and SRM are being used to estimate contribution of the major sources to ambient PM. Model predictions show that brick kilns, road dust and traffic emissions – all contribute significantly to ambient PM_{10} and $PM_{2.5}$ in Dhaka. Comparison of predicted PM with the monitored PM at a CAMS location in Dhaka provides some confidence in the developed emission inventory and S-R model. Such a model, when fully developed and calibrated, could become a very useful policy analysis tool for air quality management.

9:45 “National and Regional Emissions Projections in Europe: Methodology, Tool and Case Studies”, C. Trozzi, S. Villa, R. Vaccaro and E. Piscitello, Techne Consulting, Roma, Italy

The paper deals with emissions projections from an emission inventory for a specific year (*base* year) in different scenario.

First a Reference Scenario (do-nothing scenario), including all *planned and approved* actions taken at local, regional and national levels, is defined. In addition, this scenario will contain all socioeconomically and technological trends, like gross domestic products, population trend, fuel use, etc. This Reference Scenario is used to compare all alternative scenarios, in order to define additional measures to achieve the air quality goals and related economic costs.

Projections are evaluated for different kind of sources (area, line and point) using drivers. Emissions for future years in a single area (e.g. municipalities), line (e.g. highway) or point (e.g.plant), related to a specific activity, are estimated starting from the base year emissions and using specific projections factors (drivers) of activity level and emission factors. Drivers can be related to the whole region or limited to selected areas, lines or plants. Finally, new additional emissions are evaluated for new planned plants, units of plants, roads or area emissions.

Drivers for activity levels and for emission factors can be related to multiple activities, plants and lines. As for example, regarding activities, the model can use trends of population, energy demand, industrial productions, road vehicle fleet, average mileage and fuel consumptions. In the paper the complete methodology, the software tool and the result of application, at regional scales, in Italy and, at national scale, in some Balkan countries are reported.

10:10 **BREAK**

Session 2: Biomass Burning

Chairs: Amber Soja, NASA
Sim Larkin, USFS
Jessica McCarty, MTU

10:40 **BIOMASS BURNING PANEL** - The goal of the Biomass Burning panel will be to focus on our National Fire Emissions Inventory (NFEI) in an effort to generate the best possible, consistent future and historic NFEI that is practical. We will have a panel of experts that represent a wide range of air quality and satellite expertise, which have experience at local-, state-, regional- and global-scales.

Session 8: Mobile Sources

Chairs: Jeremy Heiken, Sierra Research
Chris Dresser, US EPA

8:30 "Driving Style Influence on Car CO_2 Emissions", A. Alessandrina, A. Cattivera, F. Filippi and F. Ortenzi, CTL Centre for Transport and Logistics, Sapienza University of Rome, Italy

Road transport is a major contributor to environmental pollution and driving style is one of the most significant among factors in the environmental impact of a vehicle. In the past two decades a new driving style, called eco-driving, has been developed to reduce CO2 emissions in driving and nowadays it is a climate change initiative not to be overlooked. CTL (Centre for Transport and Lo-gistics) has developed an innovative tool to acquire data from vehicles and to measure car fuel consumption and emissions on the road. In order to quantify the driving style influence on CO2 emissions CTL also developed an analytic method working with the acquired data and based on eco-driving rules.

A large on road campaign (10 cars, 270 drivers, 120.000 km) was made using such tools and methods. CO2 emissions as a function of average speed of the route measured in the campaign overlap on COPERT specific CO2 –speed function based on the EEA emission inventory. If all the monitored drivers had adopted the eco-driving driving-style CO2 emissions would have been up to 30% lower than the measured average at the typical urban speed (between 10 and 40 km/h on average) which is where the driver influence is higher.

8:55 "Criteria Pollutant Impacts of Mid-Level Ethanol Blends (E15 and E20)", J. G. Heiken, A. Marcucci and J. M. Lyons, Sierra Research, Inc

In the next 1 to 2 years, the US gasoline market will become saturated with low-level ethanol blends - complying with the currently allowed maximum ethanol content of 10 percent by volume in conventional gasoline. In order to increase the total ethanol blending capacity required under the Renewable Fuels Standard, the legal impediments for marketing of mid-level ethanol blends are in the process of being removed, and the use of mid-level ethanol blends, up to 15 or 20 percent by volume, in the on-road fleet is imminent. The emission inventory ramifications of mid-level ethanol blends cannot be evaluated with the current USEPA on-road inventory modeling software, MOVES2010a. This paper examines criteria pollutant consequences of mid-level ethanol blends on both exhaust and evaporative emissions from on-road motor vehicles. This analysis builds from the compilation of 3 projects competed at Sierra Research that encompassed the available emissions test information on E15 and E20 gasoline: CRC E74b, CRC A-73-1 and on-road inventory model development for Environment Canada. The analysis will also incorporate the pending USEPA analysis supporting the Tier 3 rulemaking, if available in time for inclusion (this rulemaking is scheduled for release in March 2012).

9:20 "Regional Differences in Life-Cycle Greenhouse Gas and Criteria Air Pollutant Emissions of Light-Duty Vehicles in the United States", H. Cai, J. Han, M. Wang and A. Elgowainy, Center for Transportation Research, Argonne National Laboratory, Argonne IL

To facilitate the efforts to identify greenhouse gas (GHG) and criteria air pollutants (CAP, representing CO, VOC, NOx, SOx, PM10 and PM2.5) emission-reduction opportunities that may be specific to particular regions, this paper intends to estimate regional differences in life-cycle GHG and CAP emissions from light-duty vehicles in the US, using the GREET (the Greenhouse gases, Regulated Emissions, and Energy use in Transportation) Model, a life-cycle analysis model that has been developed at Argonne National Laboratory to quantify life-cycle GHG and CAP emissions from both conventional and advanced vehicle/fuel systems. The GHG and CAP emission burdens of upstream crude oil recovery, transportation, refining and distribution activities associated with the production of gasoline and diesel from both domestic and foreign crude oil sources for the US transportation sector are explored in each of the Petroleum Administration for Defense Districts (PADD) regions. Besides, GHG and CAP emission factors of light-duty vehicle operation on the county level are calculated by using EPA's MOVES model. Results show that the life-cycle GHG and CAP emissions induced by fuel use by both gasoline and diesel light-duty vehicles differ to a varying extent among the PADD regions, due to regional differences in GHG and CAP emissions associated with various life-cycle stages, in PADD-specific crude oil source profiles, and in the vehicle operation emission factors.

9:45 “Improvements to Nonroad Growth, Activity and Population Data for Modeling”, T. Koman, H. Michaels and E. Glover, US EPA OTAQ, MI

EPA's Office of Transportation and Air Quality (OTAQ) has developed the NONROAD2008 model. New data may be available to update several of the elements in the model (such as equipment/vehicle populations and growth projections) to capture more recent data and trends. Furthermore, EPA’s long-term plans are to incorporate nonroad engines into the MOVES framework. This paper will explore ways to better characterize emissions from nonroad sources.

10:10 **BREAK**

10:40 “Locomotive Emission Inventories for the United States from ERTAC Rail”, M. Bergin, GA Environmental Protection Division; M. Harrell, IL Environmental Protection Agency; M. Janssen, Lake Michigan Air Directors Consortium (LADCO)

Three nationwide locomotive emission inventories have been developed in collaboration with twenty-seven state air protection agencies, coordinated through the Eastern Regional Technical Advisory Committee, with support from railroads and industry associations. The inventories are for Class I line-haul locomotives which travel long distances, Class I switcher locomotives which largely operate within rail yards, and for Short line and Regional locomotives which generally serve specific industries and complex rail yards and intermodal terminals. This paper presents the data and methodologies used to develop the inventories, the results, and potential improvements.

Locomotives generally utilize very large diesel combustion engines, resulting in emissions of NO_x, PM, hydrocarbons, and greenhouse gases. Emissions are regionally distributed from long-distance hauling as well as sometimes being highly concentrated in rail yards. Along with contributing to secondary pollutants such as ozone and $PM_{2.5}$, which can exceed National Ambient Air Quality Standards, locomotive emissions can directly impact sensitive populations near railroad tracks and rail yards (e.g. schools, hospitals, ‘Environmental Justice’ communities).

Locomotive emission inventory development tools often vary dramatically between states. Except for a few notable exceptions, the resulting inventories generally lack the resolution needed to support air quality modeling or ‘hotspot’ evaluation and are difficult to combine for cohesive systematic analysis. Freight transportation is projected to increase, dramatically in some areas near the East Coast due to the 2014 Panama Canal expansion, and technologies and techniques for reducing emissions and/or population exposure are available, making these inventories timely and useful to support the safe, efficient advancement of the United States railroad system.

11:05 **MOBILE SOURCES PANEL -** Understanding air emissions from Nonroad Engines is an important aspect for state and local governments seeking to attain NAAQS and in examining greenhouse gas contributions. EPA and several states are engaged in efforts to improve these estimates. The panel will discuss these developments and current research needs.

11:30 **LUNCH**

Session 10: Air Toxics

Chairs: Chun Yi Wu, MNPCA
Madhu Venugopal, Providence Engineering

8:30 “Gapfilling HAPs in the 2008 NEI”, M. Strum, US EPA

In developing the 2008 National Emission Inventory (NEI), version 2, for the point data category, EPA made efforts to supplement state, local and tribal (S/L/T) data (also referred to as “Agency” data) to produce a more complete inventory for air toxics, or hazardous air pollutants (HAPs). The additional information for HAPs come from numerous data sources, such as the 2008 Toxics Release Inventory (TRI), data collected for use in air toxics rule development, additional information provided by S/L/T agencies, HAP to criteria air pollutant (CAP) ratios applied to S/L/T-reported CAP emissions and data from previous inventories. This paper will discuss these sources of data and how EPA incorporated them with the S/L/T data to build a more complete HAP inventory for the 2008 NEI. Charts and tables showing the quantity of EPA data from these gap fill datasets are shown.

8:55 “Using the National Emission Inventory Information to Conduct Residual Risk Assessments – the Pulp and Paper Industry Experience”, K.P. Hanks, RTI International, NC; A. Crapo, NCASI Southern Regional Center, FL and J. E. Pinkerton, NCASI, RTP, NC

As required by the 1990 Clean Air Act Amendments, the U.S. Environmental Protection Agency (EPA) must evaluate residual risks from industrial source categories following implementation of maximum achievable control technology (MACT) standards. EPA began its post-MACT residual risk assessment of the pulp and paper industry in 2006, and initially used information from the 2002 National Emissions Inventory (NEI) to characterize the emission sources at pulp and paper mills. The preliminary analysis revealed there were a myriad of challenges with the NEI database that had to be addressed before useful estimates of risks could be obtained. Resolving the database issues required an iterative multi-year collaborative process involving EPA, EPA’s contractor, and industry representatives.

This paper describes several of the issues encountered and actions taken to resolve them. In particular, we address (1) accounting for the differing levels of detail in state and local agency inventories, (2) assignment of appropriate Source Classification Codes (SCCs) and MACT codes to process equipment and fugitive emission sources, (3) use of relevant emission factors, (4) handling of significant fugitive emission sources and process equipment with multiple vents, (5) appropriateness of NEI default source parameters and pollutant speciation profiles, (6) location of emission sources, (7) double counting of certain emissions, and (8) estimation of hourly emission rates for acute risk assessments.

9:20 “Assessment of Benzo(a)pyrene Emissions in the Great Lakes Region”, A. Soehl, Great Lakes Regional Air Toxic Emissions Inventory project; C. Yi Wu, Minnesota Pollution Control Agency and G. Wang, Great Lakes Commission

For the past two decades the Great Lakes States and the Province of Ontario, under the Great Lakes Regional Air Toxic Emissions Inventory project funded by the U.S. EPA, have been working on compiling the regional air toxics emissions inventories. In 2006-2007, following the completion of the 2002 regional inventory, the Steering Committee Members conducted an extensive assessment of benzo(a)pyrene emissions inventoried in the Great Lakes region. As part of this exercise, emission sources for which each jurisdiction reported benzo(a)pyrene have been compared. Furthermore, the Steering Committee Members compared the various estimation methods and available emission factors. As a result a number of errors and inconsistencies have been corrected resulting in a regional inventory with greater accuracy, consistency, and comprehensiveness.

Since then, the 2005 regional emission inventories have been compiled and 2008 inventory is expected to be submitted later this spring. Given that benzo(a)pyrene is a persistent toxic substance of regional concern, similar assessment will be conducted for the 2005 and 2008 benzo(a)pyrene emissions. This assessment will be based on recommendations of the previous study as well as new information. It is anticipated that this assessment will again reveal significant gaps and inconsistencies among the regional data, indicating that a continuous improvement of benzo(a)pyrene, and probably other toxic air emissions is necessary. This paper will summarize procedures used for this assessment, describe the findings, and compare benzo(a)pyrene emissions reported in the Great Lakes region to those submitted by other US states using the 2008 NEI dataset.

9:45 **AIR TOXICS DISCUSSION SESSION -** This open discussion will focus on preparation of the 2011 emission inventory for air toxics. The floor is open to all audiences for questions and discussion. Madeleine Strum, the OAQPS air toxics expert, and Steve Witkin, TRI expert, from EPA will be in the session to provide up to date information and answer questions

Session 7: GIS Innovative Methods Remote Sensing

Chairs: BH Baek, UNC
Alexis Zubrow, US EPA

10:40 “Long-Term, Open-Path Emissions Monitoring at Oil and Gas Exploration and Production Sites”, R. A. Hashmonay and S. H. Ramsey, PE ENVIRON

Oil and gas exploration and production (“E&P”) operations are highly distributed, both geographically and with respect to responsibility. Globally, literally thousands of entities are engaged in E&P activities. Methane and air toxic emissions from E&P operations are often ignored or poorly understood. Recent developments in the United States are requiring better accounting and reporting of greenhouse gas

(“GHG”) emissions from domestic oil and gas E&P operations; for example, the Mandatory GHG Reporting requirements found in 40 CFR 98, Subpart W. There is also increasing interest in the exposure of fenceline communities to air toxics emitted from E&P facilities. However, the available factor-based methodologies provide only a rough approximation of actual GHG and air toxics emissions from fugitive emission sources associated with E&P activities. Short-term studies around E&P facilities provide only a “snap-shot” of actual emissions that may or may not be representative of long-term emissions. Integration of open-path monitoring technologies into long-term sampling programs at E&P facilities will result in more robust data for use in developing better, long-term emission factors and in evaluating emission variability over extended timeframes. The data will also provide operators with valuable information that can be integrated into their loss prevention and compliance programs.

11:05 “Source Apportionment of Tehran’s Air Pollution by Emissions Inventory”, R. Bayat, Institute of Water and Energy, Tehran; A. Torkian, Head of Energy and Water Research Institute, Tehran; M. A. Najafi, Air Quality Control Organization, Tehran; M. Arhami, Department of Civil Engineering, Tehran; and M. H. Askariyeh, Sharif University of Technology, Tehran

The main environmental problem of Tehran is air pollution originating from natural topographic conditions as well as anthropogenic sources. The first step for managing Tehran’s air pollution problems is to identify the main stationary and mobile sources and their relative contribution. Stationary sources include residential dwellings, power plants, and industrial complexes such as Tehran refinery. Mobile sources are comprised of public and private light and heavy vehicles.

There are several source apportionment procedures with different levels of complexity and data requirements, which can be source-oriented and/or receptor-oriented. The classic source-oriented procedure is the use of emission factors to calculate pollutant generation based on the technology being employed and fuel usage. The receptor-oriented method consists of measuring and analysis of the prevailing pollutants’ concentrations and back-calculating to identify the contributors. The above methods have been applied in this study to the available information of the data of the year 2002.

The results showed that 90% of total weight of the Tehran’s air pollution is emitted from vehicles and the remaining 10% is from stationary sources. More than three fourth of the pollutants weight is CO with 98.7% being contributed from vehicles; about half from Light Duty Vehicles (LDVs) and 20% from motorcycles. Next in the line are HC and NOx with 11.4% and 8.4% of total weight, with 70% and 67.5% contribution from mobile sources. SO2 has 2.9% of the total weight, 85.8% of which is emitted from stationary sources. TSP comprises 2.4% of the total weight.

11:30 Assessing Precision and Accuracy of Atmospheric Emission Inventories”, J. L. Huertas, M. E. Huertas and J. Diaz, Automotive Engineering Research Center – CIMA, Toluca, Mexico

Assuming that state-of-the-art air quality models are accurate, then the precision and accuracy of their results directly depend on the precision and accuracy of their geographical, meteorological, and emission input data. There are important applications, such as open pit mining, in which emission data is the main source of uncertainty. In such cases, historical air quality experimental data is typically available. The present work proposes a backward air quality simulation approach to assess the accuracy of emission inventories for these applications, with the goal of identifying sources that are over or underestimated. This approach consists of finding constants of the linear combination of the estimated emission that maximize R^2 and make the slope equal to one in the linear correlation analysis when the results from the air quality model are compared to the experimental measurements of air quality. This methodology was applied to the case of the mining region in northern Colombia. As one of the largest open pit coal mining regions in the world, this region consists of 7 independent mines with no relevant additional sources of emission. Use of the proposed methodology allowed quantification of the amount by which companies over or underestimated their emission, as well as quantification of uncertainties due to sources not considered in the model but that locally affect each monitoring station.