2015 International Emission Inventory Conference

"Air Quality Challenges: Tackling the Changing Face of Emissions"

Training April 13 - 14, 2015
Conference April 14 - 16, 2015
Doubletree by Hilton San Diego Mission Valley
San Diego, California

EPA

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

Welcome to the 2015 Emissions Inventory Conference

The US Environmental Protection Agency (US EPA) looks forward to your participation in the 2015 Annual Emissions Inventory Conference in San Diego, California April 13 – 16, 2015. This year's conference focuses on how emission inventories meet the challenges posed by emerging air quality issues, with a focus on the Western US. This theme highlights issues such as:

- How inventories can be used to assess the impacts of long-range transport on local NAAQS and other air quality issues;
- How do key sectors in the Western US, including oil & gas, fires and agriculture affect local and regional air quality;
- What are the current challenges in estimating emissions for key sectors? How can we improve emission estimates for these key western sectors in inventories;
- How can we leverage work going on at the regional and local levels to inform the National Emission Inventory?
- How are such air quality emissions issues connected to emissions of greenhouse gases? How can both air quality improvement and global warming mitigation be considered in emissions methods?

Training courses on different aspects of inventory development and use will begin on Monday, April 13, 2015. This year in addition to the usual courses on MOVES and how to get data out of the Emissions Inventory System (EIS), we will also be offering training on ERTAC's EGU projection tool; the basics on preparing emissions for air quality modeling; two courses on tools to report, view, and account for GHG emissions and its reductions; a course on how EPA uses locally submitted activity data to develop fire emission estimates; a course on EPA's Oil and Gas Tool and another on other nonpoint tools that EPA develops and uses for the NEI; a course on EPA's new emission factors development procedures, as well a course on the Toxics Release Inventory. To accommodate the extra training this time, we will devote a day and a half to training. After the training is complete on Tuesday morning, the general conference will open with a plenary for all conference attendees on the afternoon of Tuesday April 14, 2015. The plenary will include a welcome by the US EPA and local hosts, and a report from the US EPA's Emissions Inventory and Analysis Group followed by a set of speakers. All these speakers will then form a panel and have a general Q&A session with the audience. A full set of technical sessions will run all day Wednesday and Thursday.

We have a very interesting lineup of poster presentations that will run from Tuesday-Thursday and the authors will be available to explain their work and answer your questions during breaks and throughout the conference.

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 San Diego and look forward to seeing you at the Conference.

Venkatesh Rao - Technical Coordinator
Kim Paylor - Conference Coordinator
US EPA Conference Organizers
Emission Inventory and Analysis Group
Office of Air Quality Planning & Standards

Schedule at a Glance

Date/Time	**Session**	**Room**
Mon Apr 13		
8:00 - 11:45	ERTAC/EGU Emission Projection Tool (I)	Shutter West I
8:00 - 10:00	Emission Inventory System (EIS)	Shutter West II
10:05 - 11:45	Toxics Release Inventory (TRI) Training	Shutter West II
8:00 - 11:45	MOVES 2014 Training	Shutter East I
8:00 - 11:45	EPA's Method for the Wildland Portion of the 2014 NEI	Shutter East II
11:45 - 1:15	**Lunch (On Your Own)**	
1:15 - 5:00	ERTAC/EGU Emissions Project - continues	Shutter West I
1:15 - 5:00	GHG Reporting Program Training	Shutter West II
1:15 - 5:00	MOVES 2014 Training - continues	Shutter East I
1:15 - 5:00	Training on EPA's Nonpoint Source Emissions Inventory Tools	Shutter East II
Tues Apr 14	**Session**	**Room**
8:00 - 11:45	Oil & Gas 101: Overview of Oil & Gas	Shutter West I
8:00 - 11:45	Preparing Emissions - Air Quality Modeling	Shutter West II
8:00 - 11:45	US GHG and AVERT Training	Shutter East I
8:00 - 11:45	EPA's New Emission Factor Procedures (I)	Shutter East II
12:00 - 1:20	**Lunch (On Your Own)**	
	Plenary Session (I)	Great Room IV and V
1:20 - 1:25	Tesh Rao – Intro to Plenary - OAR/OAQPS	
1:25 - 1:35	Chet Wayland - Welcome from OAR/OAQPS	
1:35 - 1:45	Deborah Jordan - EPA/R9/CA	
1:45 - 2:10	Marc Houyoux - OAR/OAQPS - NEI	
2:10 - 2:35	Tom Moore – WRAP/WESTAR	
2:35 - 3:00	Karen Magliano - ARB	
3:00 - 3:25	Henry Hogo - SCAQMD	
3:25 - 3:50	Kong Chiu - EPA/OAP	
3:50 - 4:10	**BREAK**	
4:10 - 5:15	Panel/Open Session with Audience	
5:15	**ADJOURNED FOR THE DAY**	

Schedule at a Glance (continues)

Date/Time	**Session**	**Room**
Wed Apr 15		
8:00 - 8:25	EI Preparation for AQ Modeling	Great Room I, II, III
	Global /International Issues	Great Room IV
	Air Toxics	Great Room V
8:25 - 8:50	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
8:50 - 9:15	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
9:15 - 9:40	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
9:40 - 10:10	**BREAK**	
10:10 - 10:35	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
10:35 - 11:00	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
11:00 - 11:25	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
11:25 - 11:50	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	Air Toxics - continues	Great Room V
11:50 - 1:20	**LUNCH (On Your Own)**	

Schedule at a Glance (continues)

Date/Time	**Session**	**Room**
Wed Apr 15		
1:20 -1:45	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	GHG Emissions including	Great Room V
1:45 - 2:10	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	GHG Emissions - continues	Great Room V
2:10 - 2:35	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	GHG Emissions - continues	Great Room V
2:35 - 3:00	EI Preparation for AQ Modeling- continues	Great Room I, II, III
	Global/International Issues - continues	Great Room IV
	GHG Emissions - continues	Great Room V
3:00 - 3:30	**BREAK**	
3:30 - 3:55	Biomass Burning	Great Room I, II, III
	Agricultural Emissions	Great Room IV
	GHG Emissions - continues	Great Room V
3:55 - 4:20	Biomass Burning - continues	Great Room I, II, III
	Agricultural Emissions - continues	Great Room IV
	GHG Emissions - continues	Great Room V
4:20 - 4:45	Biomass Burning - continues	Great Room I, II, III
	Agricultural Emissions - continues	Great Room IV
	GHG Emissions - continues	Great Room V
4:45 - 5:10	Biomass Burning - continues	Great Room I, II, III
	Agricultural Emissions - continues	Great Room IV
	GHG Emissions - continues	Great Room V
5:10	**ADJOURNED FOR THE DAY**	

Schedule at a Glance (continues)

Date/Time	**Session**	**Room**
Thurs Apr 16		
8:00 - 8:25	Mobile Sources	Great Room I, II, III
	Oil & Gas	Great Room IV
	Tools/Emerging Technologies	Great Room V
8:25 - 8:50	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
8:50 - 9:15	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
9:15 - 9:40	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
9:40 - 10:10	**BREAK**	
10:10 - 10:35	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
10:35 - 11:00	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
11:00 - 11:25	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
11:25 - 11:50	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Tools/Emerging Technologies - continues	Great Room V
11:50 - 1:20	**LUNCH (On Your Own)**	

Schedule at a Glance (continues)

Date/Time	**Session**	**Room**
Thurs Apr 16		
1:20 - 1:45	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Speciated Emissions Data of Their Use	Great Room V
1:45 - 2:10	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Speciated Emissions - continues	Great Room V
2:10 - 2:35	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Speciated Emissions - continues	Great Room V
2:35 - 3:00	Mobile Sources - continues	Great Room I, II, III
	Oil & Gas - continues	Great Room IV
	Speciated Emissions - continues	Great Room V
3:00 - 3:30	**BREAK**	
3:30 - 3:55	Mobile Sources - continues	Great Room I, II, III
	Emissions Data QA & Data Analysis	Great Room IV
	Speciated Emissions - continues	Great Room V
3:55 - 4:20	Mobile Sources - continues	Great Room I, II, III
	Emissions Data QA - continues	Great Room IV
	Speciated Emissions - continues	Great Room V
4:20 - 4:45	Mobile Sources - continues	Great Room I, II, III
	Emissions Data QA - continues	Great Room IV
	Speciated Emissions - continues	Great Room V
4:45 - 5:10	Mobile Sources - continues	Great Room I, II, III
	Emissions Data QA - continues	Great Room IV
	Speciated Emissions - continues	Great Room V
5:10	**ADJOURNED FOR THE DAY**	

Training Schedule

Monday – April 13, 2015

Course Title: Eastern Regional Technical Advisory Committee (ERTAC) Electricity Generating Unit (EGU) Emission Projection Tool
Instructor: Byeong-Uk Kim, Georgia Department of Natural Resources; Julie McDill, Mid- Atlantic Regional Air Management Association; Doris McLeod, Virginia Department of Environmental Quality; Mark Janssen, Lake Michigan Air Directors Consortium and Joseph Jakuta, Ozone Transport Commission

Time: 8:00am – 5:00pm
Place: Shutter West I

Course Description
This class will cover the theoretical background and basic operations of the ERTAC EGU Projection Tool, which estimates future year activity of fossil fuel fired, electrical generating units. Class content will include examples of how the Tool maybe applied to calculate the impacts of various air pollution control regulations (for example, the Mercury and Air Toxics Rule) on future year activity as well as NOx, SO_2, and CO_2 emissions. Students will have opportunities to operate the ERTAC EGU Projection Tool as part of hands-on exercise sessions.

Course Title: Emission Inventory System (EIS) – How Do I Get the Data Out?
Instructor: Sally Dombrowski and Jonathan Miller, US EPA

Time: 8:00am – 10:00am
Place: Shutter West II

Course Description:
This course will cover the reports function in the Emission Inventory System to include the new comparison report as well as how to pull data for a single, or group of facilities.
Target Audience: **Registered EIS Users Only.**

Course Title: Toxic Release Inventory Training Course (TRI)
Instructor: Steve Witkin and Daniel Teitelbaum, US EPA/OEI

Time: 10:05am – 11:45am
Place: Shutter West II

Course Description:
Learn more about the TRI, who reports, what is collected by regulation and what supplemental data is included in some of the TRI tools. Focusing on air releases, we will explore tried and true access points along with new ways to access the data including the new P2 tool (currently available) and the TRI Analyzer tool (schedule to go public summer 2015). We will also cover navigating the annual TRI National Analysis Report, which this year includes an expanded 'Beyond TRI' section

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Course Title: MOVES2014 Training
Instructors: Gary Dolce and Chris Dresser, US EPA/OTAQ

Time: 8:00am – 5:00pm
Place: Shutter East I

Course Description:
This full day course will focus on some of the more advanced features of MOVES2014 typically covered in the second day of the basic MOVES 2-day course. This includes using Emission Rates mode, using Custom Domains, using Project Scale, and using the Nonroad portion of MOVES. Some prior knowledge of MOVES would be helpful, but we will begin with a very quick overview of more basic MOVES tasks. Attendees will need to bring laptop computers with MOVES2014 already installed and tested. Please allow enough time ahead of the course for installation and testing, as we will not be able to resolve installation problems the day of the course.

Course attendance will be limited to 40.

Course Title: EPA's Methods for the Wildland Fire Portion of the 2014NEI – A Focus on State-Provided Data
Instructors: Sean Raffuse, Sonomatech and Sim Larkin, USFS

Time: 8:00am – 11:45am
Place: Shutter East II

Course Description:
This course will cover EPA's methods for the Wildland fire portion of the 2014 NEI, with a focus on state provided data. We will provide an overview of how the emissions are calculated, discuss why local data are important, and explain how local data are used. The specific fire information needed by the SmartFire-BlueSky emissions process, as well as formats and timelines, will be covered in depth. The course is aimed at states looking to improve emission estimates for their area by becoming engaged in the process, but anyone with interest in US Wildland fire emissions is welcome.

Course Title: Greenhouse Gas Reporting Program Training
Instructors: Kong Chiu and Alexis McKittrick, US EPA

Time: 1:15pm – 5:00pm
Place: Shutter West II

Course Description:
The GHG Reporting Program collects facility-level greenhouse gas emissions data from individual facilities above certain emissions thresholds. Through this program, EPA provides specific facility and supplier-level emissions data for approximately 85-90% of total U.S. GHG emissions. EPA has been collecting data from facilities through the GHGRP since 2010 for most sectors, and has published annual emissions data from all facilities covered by the GHGRP for 2010-2013 through the Facility Level Information on Greenhouse Gases Tool (FLIGHT) and associated data products.

This course is for anyone interested in learning more about this data set. The course is divided into a few parts. The course will begin with background about the program and its coverage. The next part will walk through EPA's process for collecting and verifying data, including features and workflows in EPA's electronic data management system that support data validation and compliance follow-up with reporters.

EPA will then provide an overview of how to access GHGRP data on-line, including how data is being shared with state and local governments and how states can incorporate the GHGRP data collection into their own programs. EPA also will provide a deeper dive into the data collected from the oil and gas industry, special considerations to keep in mind when accessing this data, and an update on newly collected activity data for this industry. Time for questions and answers will be provided during and after the presentation. If possible, participants are encouraged to review the reporting requirements and data publication tools offered by the Greenhouse Gas Reporting Program prior to the session (http://www.epa.gov/ghgreporting/).

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Course Title: Training on EPA's Nonpoint Source Emissions Inventory Tools
Instructor: Jennifer Snyder, US EPA and David Cooley and Jonathan Dorn Abt Associates

Time: 1:15pm - 5:00pm
Place: Shutter East II

Course Description:
EPA, along with Abt Associates, has developed and improved several tools over the past year to help estimate nonpoint source emissions at the county level. These include individual tools to estimate emissions of criteria pollutants and HAPs from:

- residential wood combustion;
- combustion at industrial, commercial, and institutional facilities; and
- solvent use.

Each of these tools has recently been released to the public to allow state, local, and tribal agencies to more easily estimate emissions from these sources.

The training session will be led by Abt Associates staff that have helped to develop and update these tools, including improving their accuracy, efficiency and user friendliness. The training will include an overview of the tools and a discussion of the procedures used and assumptions made to estimate emissions. There will also be an interactive demonstration of each tool using sample datasets.

Participants are encouraged to bring their laptops to run the tools during the training session. The tools and sample datasets are will be available for download a week prior to the conference. (**Note that MS Access must be installed on the laptop.)**

Training Schedule (continues)

Tuesday – April 14, 2015

Course Title: Oil and Gas 101: An Overview of Oil and Gas Upstream Activities and Using EPA's Nonpoint Oil and Gas Emission Estimation Tool for the 2014 NEI
Instructor: Jennifer Snyder, US EPA and Regi Oommen and Mike Pring, Eastern Research Group

Time: 8:00am – 11:45am
Place: Shutter West I

Course Description:
Nonpoint source emissions from the oil and gas exploration and production sector has gained interest in recent years in the United States as drilling technology has allowed development of unconventional oil and gas plays (such as shale or tight sands) in areas where there was previously no activity, or where activity had subsided after depletion of the conventional reserves. While the major emissions sources associated with oil and gas collection, processing, and distribution have traditionally been included in the National Emissions Inventory (NEI) as point sources (e.g. gas processing plants, pipeline compressor stations, and refineries), the activities occurring "upstream" of these types of facilities has not been as well characterized. EPA developed the Nonpoint Oil and Gas Emission Estimation Tool to assist state and local agencies with estimating emissions from these upstream sources.

This course is for stakeholders interested in learning about the types of sources and emissions that may occur at upstream oil and gas exploration and production sites and for those interested in using the Nonpoint Oil and Gas Emission Estimation Tool to compile an emissions inventory for this important source category. The course is divide into three parts. The first part will provide a general overview of the upstream oil and gas exploration and production processes and emissions covered by the tool. The second part includes a discussion of EPA's plans for the 2014 NEI pertaining to oil and gas. The third part will cover use of the tool to compile emissions estimates and prepare them for submittal to EPA and the 2014 NEI.

Participants must bring their own laptop computers with the lates version of the Nonpoint Oil and Gas Emission Tool already installed prior to the beginning of the course. Intended audience – Federal/State/Local/Tribal Agencies and Contractors.

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Course Title: Preparing Emissions for Air Quality Modeling – The Basics
Instructor: Alison Eyth, Alexis Zubrow and Rich Mason, US EPA

Time: 8:00am – 11:45am
Place: Shutter West II

Course Description:
In the Preparing Emissions for Air Quality Modeling class, we will discuss the techniques and steps involved with taking emissions inventories and preparing them for use in air quality models. Topics will include describing the processes of chemical speciation, temporal allocation and spatial allocation, along with the non-emission inventory data sources used for each process. We will also review the typical quality assurance steps performed to ensure that the emissions modeling steps completed successfully such that the inventory data is properly and fully reflected in the air quality model inputs. Techniques used to develop emissions for future year modeling will be discussed. This class will be lecture only, meaning that no hands-on computer programs will be used during the training. We plan to allow plenty of time for questions and answer sessions on each major topic covered.

Course Title: US Greenhouse Gas (GHG) Emissions and Avoided Emissions and Generation Tool Training (AVERT)

Instructor: Robyn DeYoung and Leif Hockstad, US EPA/OAP

Time: 8:00am – 11:45am

Place: Shutter East I

Course Description:

EPA will present an overview of GHG emissions in the US and its AVert tool that can be used to estimate emissions benefits of actions.

EPA publishes an annual national level Inventory of U.S. Greenhouse Gas Emissions and Sinks. 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. Topics covered during the training will include: the history, purpose, and scope of this report; the coverage of sources and sectors in the U.S.; the data sets and methodologies used in calculating national greenhouse gas emissions; recent trends and long-term trend drivers; and, new tools offered to download data and graphics from the report.

In addition, EPA has developed a free and user friendly tool to estimate emissions impacts of energy efficiency (EE) and renewable energy (RE) policies and programs so that air quality planners can incorporate those impacts into their NAAQS SIPs. The AVoided Emissions and geneRation Tool (AVERT) quantifies the displaced sulfur dioxide (SO2), nitrogen oxides (NOx), and carbon dioxide (CO2) emissions of EE/RE policies and programs within the continental United States (Alaska, Hawaii, and U.S. Territories are not modeled). AVERT captures the actual historical behavior of electricity generating units' (EGUs') operation on an hourly basis to predict how EGUs will operate with additional EE/RE delivered to the electricity grid.

The AVERT training will teach participants how to use AVERT to analyze different types of EE programs, wind, geothermal and solar technologies within AVERT's main module. Participants will learn how to interpret the various output display tables and work with SMOKE-ready outputs for use in air quality models.

The AVERT training will also walk through the steps participants would need to take to modify base year data with specified retirements, additions and emission rate changes and re-run the baseline data through AVERT's Statistical Module to create a new future-year for analysis in the Main Module.

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: 1990-2013, the most recent annual report on national level greenhouse gas emissions. The second (~ 2.5 hours) will focus on the AVoided Emissions and geneRation Tool (AVERT) and how to use the tool and run scenarios.

Course Title: EPA's New Emissions Factor Development Procedures
Instructor: Mike Ciolek, US EPA

Time: 8:00am – 11:45am
Place: Shutter East II

Course Description:
Over the last eight years, the EPA has been developing a multi-part process to improve the air pollutant emissions factor program and to make the program self-sustaining. In August 2013, the EPA posted a draft final document describing the new emissions factor development procedures. This document supersedes the previous guidance for emissions factor development (*Procedures for Preparing Emission Factor Documents* (EPA-454/R-95-015, November 1997)). The document presents an introduction to emissions factors and provides the historical background for how and why the EPA has developed recommended emissions factors for stationary emissions units or processes. It describes the new approach and procedures that the EPA will follow when developing new or revising existing emissions factors and the procedures, data evaluation criteria, associated tools, and data management systems that the EPA recommends for developing air pollutant emissions factors for stationary emissions units or processes.

In order to implement these new procedures, the EPA has developed a number of tools, including a Microsoft Access© desktop application called the Electronic Reporting Tool (ERT), a portal in the EPA's Central Data Exchange called the Compliance and Emissions Data Reporting Interface (CEDRI), and an interactive emissions factor database called Web Factor Information Retrieval (WebFIRE). This presentation will discuss how all of the pieces fit together. We will then step through the new procedures and how to access emissions data collected electronically. Finally, we will discuss new procedures that will allow people to create their own specialized emissions factor.

POSTER SESSION

Tuesday	Wednesday	Thursday
8:00am - 5:00pm	**8:00am - 5:00pm**	**8:00am - 12:00pm**

1. “BOEM’s year 2011 Emission Inventory for the Gulf of Mexico Outer Continental Shelf”, H. Ensz, BOEM; R. Oommen, ERG.

2. “Show Me the Data: Improving Results of RTR Residual Risk Assessments”, A. Pope and T. Palma, US EPA; S. Enoch, ERG

3. “Emissions Development for Air Quality Forecasts in the Pacific Northwest”, F. Herron-Thorpe, S. Summers, S. Otterson, WA State Dept. of Ecology; J. Vaughan and D. Polley, Washington State University.

4. “Fires in Washington State – Working Towards Better Estimates for the NEI,” F. Herron- Thorpe, WA State Dept. of Ecology.

5. “Burning Estimates on the Flint Hills using MODIS, NLCD, and R”, A. Hawkins, US EPA; Y. Tang, and D. Watson, Kansas Dept. of Health and Environment.

6. “Development of a 2010 year Emission Inventory for the Modelling Regional Air Quality in the Canadian Arctic”, R. Munoz-Alpizar, S. Cousineau, M. Sassi, and P. Bellavance, Environment Canada

7. “Near-Term Climate Mitigation by Short-Term Forcers,” S. J. Smith, PNNL-University of Maryland

8. “The Global Emissions Initiative (GEIA) – Working for Better Emissions Information across the World”, G. Frost, NOAA; L. Tarrasón, NILU/Norway; C. Granier, NOAA, University of Colorado, LATMOS/IPCL; M. Planck Institute for Meteorology/Germany; P. Middleton, Panorama Pathways.

9. “Review Georgia Onroad Emissions in NEI2011, Di Tian, G. Grodzinsky and J. Boylan, GA DNR.

10. “Arizona’s Consolidated E-Technology Solutions”, M. Burton and L. Toopal, AZ DEQ.

11. “The ECCAD Database: Access to Global and Regional Emissions Data ” S. Darras, SEDOO, Observatorie-Midi-Pyrennes, France; C. Granier, LATPOS/IPSL, Sorbonn Universites, Paris, CIRES, University of Colorado, NOAA; C. Liousse, Laboratoire d’ Aerologie, France; D. Boulanger, SEDOO, Observatorie-Midi-Pyrennes, France; E. Enriquez, SEDOO, Observatorie-Midi-Pyrennes, France; K. Sinderalova, and T. Doumbia, LATMOS/IPSL, Sorbonn Universites, Paris

12. “A Well-to-Wheels Life Cycle Assessment for the Bus Rapid Transit System TransMilenio and Comparison with other Modes of Passenger Transportation”, Y. Cuellar, R. Buitrago, and L. C. Belalcazar, Universidad Nacional de Colombia.

13. “AVERT –EPA’s New Tool that Estimates the Emission Impacts of Energy Efficiency and Renewable Energy Using Statistically Driven Behavioral Simulation of Historical EGU Dispatch Patterns”, R. DeYoung, US EPA and J. Fisher, Synapse Energy Economics.

14. “Air Emissions from Biopower Production”, M. Carreras-Sospedra, J. Brouwer, and D. Dabdub, UC-Irvine; R. Williams, California Biomass Collaborative

15. “Impact of Applying a Woodstove-temperature Adjustment to Residential Wood Combustion Emissions in the Pacific NW for use with AIRPACT-4 Air Quality Forecasting System”, D. Polley, J. Vaughn, B. Lamb and S. Chung, Washington State University; and C. Bowman and S. Otterson, WA Dept. of Ecology

16. “Assessment of Artificial Intelligence based Air Quality Forecasting Models addressed to Anthropogenic Emissions”, D. Mishra and P. Goyal, Centre for Atmospheric Sciences, IIT-New Delhi, India.

17. “Development of Future Year Mexico Emissions”, M. E. Wolf and G. K. Manne, ERG and A. Eyth and R. Tooly, US EPA.

18. “Development of some Improved Canadian Spatial Surrogates”, Q. Zheng, M. D. Moran and J. Zhang, Environment Canada.

19. “Enhancements in the EIS Reporting Functionality”, J. Miller, US EPA

20. “Web-based Data Sharing in NC”, T. Manning and B. McLamb, NC DENR.

21. "Photochemical Modeling of Future Year Emission Estimates With ERTAC" M. Janssen and A. Cohan, LADCO

22. “Comparative Analysis of SMOKE-MOVES and DTIM-EMFAC’s Gridden Emission Inventory Output”, H. Perugu, and L. Ramirez, CARB; J. Koupal, ERG; and BH Baek, UNC-Institute for the Environment.

23. “Oklahoma’s Tips and Tricks for EIS Point Source Submission,” C. Schroeder, OK DEQ

24. “EPA’s Residential Wood Combustion Tool: Improvements and Applications,” D. Cooley and J. Dorn, Abt Associates and J. Snyder and R. Huntley, US EPA (Retired)

25. “Air Emissions Reporting Improvements through EPA’s E-Enterprise,” M. Houyoux and S. Dombrowski, US EPA

26. “Macroscopic Relationship between Network-Wide Traffic Emissions and Fundamental Properties of the Network,” R. Shabihkhani, Rutgers University and E. J. Gonzales, University of Massachusetts - Amherst.

27. “An Analysis on 2011NEI Mobile Source Inventory Generated by MOVES and SMOKE-MOVES,” J-S. Lin, VADEQ, J. McDill, MARAMA, and E. Zalewsky (NYSDEC).

Exhibitors

Abt Associates, Inc – Abt Associates is one of the premier providers of analytic support to key environmental agencies. Since 1979, we have contributed to improvements in water quality, cleaner air, and safer drinking water, less hazardous chemical products, safer pesticide usage and less risky dams and levees. We are also analyzing the impacts of and strategies to mitigate and adapt to, climate change.

Our unbiased, state-of-the-art solutions help ensure that investments in environmental protection provide the greatest possible returns – and, as a result, save lives and restore ecosystems.

Our research and analytic staff consists of economists, scientists, ecologists, engineers, programmers, environmental modelers, and public health professionals. Our clients include the US Environmental Protection Agency, Army Corps of Engineers, National Oceanic and Atmospheric Administration, Coast Guard, and Department of Energy, as well as other federal agencies, state and local governments, and non-profit organizations.

Abt also works across the globe. Our international environment and climate change projects are funded by the U.S. Agency for International Development, the Inter-American Development Bank, and the Asian Development Bank, the World Bank, foreign ministries and selected private sectors clients.

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 400 consists of engineers, environmental scientists, information technology experts, and communication specialists with over 30 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 with you and provide more detailed information and insight on how our capabilities can address your needs (www.erg.com).

Ecotek – is a diversified company with solid environmental compliance consulting and information technology capabilities. We specialize in environmental compliance software development and database management services.

Ecotek has been assisting regulatory agencies with Annual Emissions Reporting Programs and electronic reporting tools since 1995. Most recently a new improved consolidated Point Source Criteria. Toxics and GHG Annual Emissions Inventory web tool has been developed by SCAQMD and Ecotek based on Devised level reporting.

Peak Laboratories, LLC - Peak Laboratories is the only EPA equivalent method approved for continuous CO in air monitoring that is not NDIR based. It is approved for both 0-50 ppm and 0-1 ppm ranges. In addition, our unique technology has been used to discretely measure benzene, 1, 3 butadiene, ethylene, formaldehyde and other unsaturated hydrocarbons in air below 5 ppb.

Peak Labs designs and manufactures fully integrated process GCs for ppt >> % level analysis. The Peak Performer 1 GC platform is suitable for continuous or batch monitoring in laboratories or field environments. Peak GCs have been used for both trace level ambient air and research applications worldwide. Peak Laboratories also collaborates with other industry leaders who provide fully automated ozone precursor GCs.

UNICON International – UNICON is a Columbus, Ohio based IT Services Company and the developer of the IMPACT system used by the Wyoming Air Quality Division and the STARS2 system used by the Ohio Division of Air Pollution Control. UNICON developed both systems to provide a comprehensive, integrated system for managing all of the primary functions of these agencies including facility inventory, permit applicants (including NSR and Title V), permits, emissions inventories, and compliance reporting (including stack tests and enforcement actions). The systems feature a powerful, integrated workflow management system, extensive system administrator functions, fine-grained user access controls, and many other features. The systems also provide separate modules for internal (agency) and external (industry) users. The industry portal includes extensive data validation capabilities and support for user classes such as editors (preparers) and eSigners (submitters). Both IMPACT and STARS2 are CROMERR compliant. UNICON developed the systems as web-based Java systems using either Oracle or Microsoft SQL Server as the back-end database.

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. **-** is an information systems consulting firm headquartered in Portland, Oregon. Windsor was founded in 1998 and specializes 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) developed by Windsor 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 and provides the ability to configure the system to meet each agency’s unique needs.

Wednesday Morning – April 15, 2015

Session 1: EI Preparation for Modeling Including Projections — **Chairs: Alison Eyth, US EPA/OAQPS; Wayne Boulton, RWDI**

8:00 "Emissions Inventory Preparation in Support of High-Resolution CMAQ Modelling Applications", W. Boulton, J. Lundgren, G. Conley, M. Gauthier, A. Wolfe, and C. McClellan, RWDI AIR Inc.; M.D. Moran, J. Zhang and Q. Zheng, Air Quality Research Division of Environment Canada; Z. Adelman and M. Omary, UNC Institute for the Environment; L. Aubin, and K. McAdam Regional Municipality of Peel Public Health Department.

The Regional Municipality of Peel (Peel Region) has a population of more than one million people and is situated just west of and adjacent to the City of Toronto in Ontario, Canada. Peel Region has embarked on a project to develop a flexible and comprehensive air quality modelling and monitoring system, the purpose of which is to study the impacts of potential emission scenarios and guide policy decisions relating to public health, urban growth, and sustainability programs.

The modeling system is based on WRF/SMOKE/CMAQ, and has been used with nested 36-km, 12-km, 4-km and 1-km resolution grids to perform year-long model simulations for 2012. The parent 36-km domain covers most of northeastern North America. The inner-most, 1-km resolution domain covers Peel Region and much of the rest of the heavily urbanized region around the western portion of Lake Ontario, referred to locally as the "Golden Horseshoe". Major urban centres within the 1-km domain include the Cities of Toronto, Mississauga, Burlington, Hamilton, St. Catharine's and the Town of Oakville. Emissions processing was performed using SMOKE to arrive at hourly, gridded, and chemically speciated emissions for each model domain. This paper provides a commentary on the challenges, benefits and pitfalls of preparing input emissions fields for high-resolution model grids. Particular focus will be placed on the need to develop high-resolution spatial surrogates to ensure an accurate allocation of emissions within the 1-km model domain

8:25 "ERTAC EGU Tool: Origin and Uses," D. McLeod, VA DEQ; J. McDill, MARAMA; M. Janssen, LADCO; J. Jakuta, OTC; B-U Kim, GA EPD; and J-S Lin, VA DEQ.

Future year emission estimates from electrical generating units (EGUs) are critical to the development of state implementation plans and air quality modeling exercises, both of which are required by the Clean Air Act to improve air quality. States and planning organizations worked together to develop a no-cost, stable, and transparent estimation tool suitable for this type of inventory and modeling work. Design of this tool emphasized the importance of peak day and hourly emissions and included conservative assumptions about fuel changes, regional generation distribution, and plant operation. The tool uses a variety of inputs to develop reasonable future year estimates of emissions and activity from these units. Users may customize these inputs to produce outputs that reflect state or regional concerns. This presentation focuses on the need for such a tool in SIP and modeling efforts, use of the tool in a variety of regulatory and reporting scenarios, current efforts underway, and future applications of the tool to address a variety of questions about the EGU sector.

8:50 "Projections of Wildland Fire Emissions Corresponding to Vegetation Changes Due to Climate Change," M. Mullen, T. G. Pace and James Wilson, SC&A, Inc.

Available climate forecasts have typically projected significant increases in wildfire activity due at least in part to climate change. Additionally, wildfires are a significant source of PM emissions in the western states contributing to deteriorating air quality, regional haze, and health impacts. The MC1 model has been developed to provide the capacity to estimate climate change effects on vegetative growth, carbon storage, and wildfire incidence in the contiguous US.

This paper discusses the development of wildfire emission inventories (PM10, PM2.5, CO, CO2, methane and non-methane hydrocarbons), under a base and policy case that assumed global-scale GHG mitigation, using output from the MC1 model. In order to make the emission estimates, SC&A needed to first understand, and then adapt the MC1 output to derive data on fire start dates and duration using the available outputs of the MC1 model. The variability of emissions over time and emission trends during the 100-year projection period are presented. The paper also presents several recommendations to improve the MC1 model output to make the data more usable in climate and air quality modeling. The wildfire emissions developed under this project are part of a broader, multi-sector climate change impacts project called the Climate Change Impacts and Risks Analysis (CIRA), coordinated by the US EPA, for use in the climate change and air quality modeling analysis being performed by MIT as part of the CIRA project.

9:15 "Changes in Emissions due to GHG Mitigation Strategies," M. MacKinnon, M. Carreras-Sesperda, J. Brouwer and D. Dabdub, UC-Irvine.

Future efforts to mitigate climate change will include transitions to alternative technologies and fuels seeking reductions in greenhouse gas (GHG) emissions from United States (US) energy sectors. In addition, displacement of conventional energy strategies will impact emissions of pollutant species directly influencing regional air quality (AQ) due to common generation processes and sources. Currently, sectors of paramount concern include transportation and power generation, which combined total over half of domestic GHG emissions and account for the bulk of emissions driving primary and secondary AQ concerns in many US regions, including ambient concentrations particulate matter. The present study analyzes the potential reductions in criteria pollutant emissions caused by an increased penetration of renewable sources of energy, novel technologies and cleaner fuels for transportation in three different regions of interest in the United States: California, Texas, and the Northeastern US (NEUS). The emission reductions are evaluated for the year 2055 with respect to a reference case projected using the Market Allocator (MARKAL) model. The emissions are based on the US Environmental Protection Agency's National Emissions Inventory, and spatially and temporally resolved using the Sparse Matrix Operational Kernel Emissions (SMOKE) model. The effects of the emission changes on aerosol formation are evaluated using the Community Multiscale Air Quality (CMAQ) model.

9:40 BREAK

10:10 "2010 Canadian CAC Emission Inventories for the Air Quality Modelling Platform Supporting Policy Regulations," M. Sassi, M. Samalli, J. Racine and S. Cousineau, Environment Canada

Environment Canada developed an updated air quality modelling platform used to assess the impact of current and future criteria air contaminant (CAC) emissions on the environment and the human health. Current platform configuration is based on year 2010, updating from a 2006 platform configuration. Among the various changes to the platform, the one of interest for this presentation is the update of the emission inventories. 2010 Canadian CAC emissions inventory, compiled by the Pollutant Inventories and Reporting Division (PIRD) of Environment Canada, was used to prepare air quality modelling inputs. Both top-down and bottom-up approaches were used for the compilation and a link to the complete documentation is available upon request. The 2010 inventory database compiled by PIRD was then further processed by the Air Quality Modelling Applications Section (AQMAS) of Environment Canada for the 2010 Canadian air quality modelling platform. As a result a first package was put together and provided upon request to the air quality modelling community in summer 2014. A second version of the package is expected to be ready in spring 2015. An overview of these source-sector-specific updates along with a general overview of the platform emission inventories will be described in this presentation.

10:35 "Emissions Preparation for High-Resolution Air Quality Modelling over the Athabasca Oil Sands Region of Alberta, Canada," J. Zhang, Q. Zheng, M. D. Moran, P. A. Makar, A. Akingunola, S.-M. Li and G. Mason, Environment Canada; M. Gordon, York University; and R. Melick, Alberta Environment & Sustainable Resource Development

Alberta's oil sands, which are located mainly in the Athabasca Oil Sands Region (AOSR) of northeastern Alberta, are the third-largest proven crude oil reserves in the world. Due to higher oil prices and the availability of new bitumen extraction technology, the extraction and processing of crude oil from oil sands has gone through a rapid expansion in the AOSR over the past decade and production is forecast to increase even more in the future. However, with such increasing industrial development activity come challenges to manage accompanying environmental impacts. To better understand these impacts, an intensive air quality field study was carried out in the AOSR during summer 2013. As part of the field campaign and post-campaign studies, Environment Canada's Global Environmental Multiscale – Modelling Air-quality and Chemistry (GEM-MACH) AQ modelling system was set up to conduct nested AQ forecasts at model grid resolutions down to 2.5 km. This presentation will focus on the development of model emissions for the 2.5-km model domain centered over the AOSR. Topics that will be covered in this presentation include (1) study area and emission requirements for this study, (2) gap analysis and consolidation of inventories from various sources, (3) generation of facility-specific spatial surrogates, temporal profiles, and VOC speciation profiles, (4) revision of biogenic emissions to account for land-use changes, and (5) abnormal emissions events. Issues with the emissions processing will be reviewed and measures taken to address these issues will be discussed, such as conflicting stack parameters obtained from different data sources. An evaluation of model emissions with emissions estimated from aircraft observations will also be shown.

11:00 "GCAM-USA--A Tool for State-Level Energy and Emission Projections," S. Smith, P. Kyle and P. Patel, Joint Global Change Research Institute/PNNL.

We discuss the capabilities of the Global Change Assessment Model (GCAM) to provide insights into state-level energy and air emissions issues. The GCAM is a dynamic-recursive model with relatively technology-rich representations of the economy, energy sector, land use and water linked to a simple climate model. The model is open source, runs in 5-year time steps out to 2100, and has long been used to explore climate change mitigation policies including carbon taxes, carbon trading, regulations and accelerated deployment of energy technologies. The model has also been used to examine interactions between air pollutant emissions, climate policy, and climate change. The model has recently been extended as GCAM-USA to resolve the fifty US states and the District of Columbia. This enhanced tool has the capability of modeling state-level energy supply and demand coupled with air pollutant, and greenhouse gas emissions, all within a consistent global modeling framework. This allows future U.S. scenarios to be evaluated within the context of global scenarios, including consistent changes in both domestic and international emissions. The relatively high level of detail in the electric, transportation, building and agricultural sectors facilitates evaluation of specific technologies, renewable energy and energy efficiency measures. These evaluations can be conducted at the state, regional and national levels.

11:25 "Recent Updates to Spatial Surrogates for Modeling U.S. Emissions Sources" Z. Adelman, B. Ness, M. Omary and L. Ran, UNC Institute for the Environment; A. Bar-Ilan, T. Shah and J. Grant, ENVIRON; R. Mason, A. Eyth and A. Zubrow, US EPA.

Spatial surrogates are geospatial data that are used to allocate nonpoint emissions inventory sources to air quality modeling grids. For modeling studies prior to 2012, EPA used and distributed spatial surrogates primarily from the year 2000 and earlier. The completion of the 2010 U.S. Census along with the release of other new geospatial datasets and innovations in emissions modeling provided the opportunity to update the spatial surrogates for U.S. emissions sources. The fall 2011 release of the 2010 U.S. Census population and housing database provided the basis for several updated surrogates. Year 2010 roadway data from TIGER and rail/port data from the National Transportation Atlas Database also supported several surrogate updates. Additional surrogate updates included home heating, building square footage, land-use/land-cover based surrogates, oil and gas production, commercial businesses, and offshore shipping and ports. New spatial surrogates for the sources simulated by MOVES 2014 include off-network surrogates and potential idling locations for heavy-duty diesel hoteling. We used the Spatial Allocator Surrogate Tool to generate gridded surrogates on national 36- km, 12-km, and 4-km grids as well as polygon surrogates on U.S. census tracts. This paper describes the database of underlying shapefiles, the surrogate creation methodology, and outstanding issues with the new surrogate data

11:50 LUNCH

Session 2: Global/International Issues

Chairs: Rebecca Tooly, US EPA/OAQPS
Greg Frost, NOAA

8:00 "Changes in Anthropogenic Surface Emissions during the past Decades: Comparisons between Different Global and Regional Inventories", C. Granier, NOAA & Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder; K. Sindelarova and T. Doumbia, LATMOS/IPSL, France; S. Darras, and C. Liousse, Laboratoire d'Aerologie, France; H. Denier van der Gon, TNO, The Netherlands; G. Frost, NOAA; and G. Janssens-Maenhout, Joint Research Center, Italy.

Accurate, timely, and accessible emissions information is critical for understanding and forecasting atmospheric composition at the global and regional scale. Over the past few years, several inventories providing the distributions of surface emissions of different chemical compounds were developed at both the global and regional scales. We will review the most recent developments in surface emissions inventories, and provide details on the newest publicly available datasets.

The quality of emissions inventories is very difficult to assess, since the methodology, input data and assumptions vary strongly between the inventories. We will discuss an evaluation of emissions distributions for the 1970-2010 period, and focus on the emissions of the following compounds: CH4, CO, NOx, SO2, black and organic carbon, VOCs and ammonia. The consistency between global and regional datasets in different regions of the world will be discussed.

A global chemistry-climate model has been used to simulate the evolution of the atmospheric composition over the past decades; this will allow us to evaluate if past changes in emissions are consistent with surface and satellite observations. We will focus the discussion of the results of the simulations on changes in ozone, carbon monoxide and nitrogen dioxide distributions in the USA and Europe.

8:25 "A Community Emissions Data System (CEDS) for (developing) Historical Emissions," S. Smith, Pacific Northwest National Laboratory.

Historical emission estimates for anthropogenic aerosol and precursor compounds are key data needed for Earth system models, climate models, and atmospheric chemistry and transport models, both for general analysis and assessment and also for model validation through comparisons with observations. Current global emission data sets have a number of shortcomings, including timeliness and transparency. Satellite and other earth-system data are increasingly available in near real-time, but global emission estimates lag by 5-10 years. The CEDS project will construct a data-driven, open source framework to produce annually updated emission estimates. The basic methodologies to be used for this system have been used for SO2 (Smith et al. 2011, Klimont, Smith and Cofala 2013), and are designed to complement existing inventory efforts. The goal of this system is to consistently extend current emission estimates both forward in time to recent years and also back over the entire industrial era. The project will produce improved datasets for global and (potentially) regional model, allow analysis of trends across time, countries, and sectors of emissions and emission factors, and facilitate improved scientific analysis in general. Consistent estimation of uncertainty will be an integral part of this system. This effort will facilitate community evaluation of emissions and further emission-related research more generally.

8:50 "Global Methane Emissions and Impacts on Regional Air Quality," D. Henze, CU-Boulder.

Trends in global concentrations of methane have been influenced by a range of factors, from variable biogenic emissions to rapidly evolving anthropogenic sources such as natural gas production and use. This presentation will review past trends and future projections of methane sources. Methane is of interest as both a greenhouse gas and also an atmospheric pollutant via its impact on ozone, which in turn impacts human and ecosystem health. Recent and new modeling work evaluating the role of methane emissions controls to mitigate these impacts in tandem with climate change will be discussed.

9:15 "Comparisons of Asian Emissions Inventories," E. Saikawa, C. Young, H. Kim, and M. Zhong, Emory University; J. Kurokawa, Asia Center for Air Pollution Research, Japan; Y. Zhao, Nanjing University, China; G. Janssens-Maenhout, Joint Research Center, Italy; Q. Zhang, Tsinghua University, China; T. Ohara, National Institute of Environmental Studies, Japan, and A. Nagpure, University of MN

Urban emissions, especially from the transport sector, have been increasing rapidly in China and India. Modelers use global and regional emissions inventories to assess temporal and spatial distribution of these emissions to estimate their impacts on regional and global air quality and climate. However, large uncertainties exist in emissions inventories and quantification of this uncertainty is essential for better understanding of the linkage between emissions and air quality, climate, and health. We focus on this uncertainty by comparing emissions of carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter (PM), black carbon (BC), and organic carbon (OC) from China and India in multiple emissions inventories: from global to national. In addition to the total emissions, we also analyze emissions from five sectors and at the provincial level. We find large discrepancies among the inventories in the residential and transport sectors in the urban areas, which are very important for calculating human exposure. Regional and global emissions inventories often used in climate and chemical transport models do not necessarily reflect the spatial distribution and local peculiarities of the emissions, especially in China and India.

9:40 BREAK

10:10 "Traffic Emission in Asian Cities and Co-Benefit of Faster Vehicle Technology Intrusion," N. T. K. Oanh, Asian Institute of Technology, Thailand

Road traffic remains a major contributor of toxic air pollutants and short-lived climate pollutants (SLCP) in large urban areas in Asia. This paper comparatively analyzes on-road vehicle fleets and the emission for Asian cities produced at the Asian Institute of Technology: Bangkok, Kathmandu, Hanoi and Ho Chi Minh City. Surveys were conducted in the cities during 2010-2014 following the approach generally employed to collect input data for the International Vehicle Emission (IVE) modeling. Large shares of pre-Euro vehicles were still observed in traffic fleets, especially for public bus and truck. Except for small share of Euro 4 in the personal car fleets Euro 3 was generally the most advanced technology level found in these cities. Motorcycle (MC) fleet was the most dominant in the urban traffic. The annual emission of toxic air pollutants (particulate matter and gases, collectively) from on-road fleets in Bangkok; Kathmandu; Hanoi; and Ho Chi Minh City was 724; 59; 1518 and 4085 kt, respectively. The annual emission of GHGs and SLCPs in CO_2 equivalent in these cities was 2183; 4879; 54189 and 51674 kt, respectively. If all on-road vehicles in each city would at least compile with Euro 3 then the annual emission would be reduced by 44-67% for toxic air pollutants and 50-61% for climate forcing. The potential co-benefits would justify the efforts to bring in cleaner on-road vehicle fleets in Asian cities.

10:35 "Domestic Fuel Combustion in Un-electrified Low-income Settlements in South Africa," S. Naidu, South African Weather Service; S. Piketh, North-West University and C. Curtis, University of the Witwatersrand, South Africa.

Domestic fuel combustion in low-income settlements of South Africa has become a major source of urban air pollution. Low-income households that house a large portion of the South African population consume vast quantities of coal, wood, kerosene and other substances in order to provide for their energy needs. Only a small amount of work has been done in the way of developing any sort of domestic combustion emissions inventory in South Africa. For this reason, a lack of South African literature surrounding this topic breeds uncertainty in not only the fuel types being utilized but also the quantities of these fuels being consumed in low-income settlements, as well as the associated impacts. To better understand the relationship that exists between domestic combustion and the resultant pollutants, a method of quantifying these pollutants has been developed for Zenzele, a completely un-electrified settlement near Johannesburg. This was achieved using the quantities and types of fuel consumed. In un-electrified households, kerosene and liquid petroleum gas, used specifically for cooking and lighting, are the most commonly used fuel types during the warmer months. During winter, low-income households favour solid fuels such as wood and coal. As the temperature decreases, the rate at which these solid fuels are consumed increases. The most significant observations identified in this study are the diurnal and seasonal trends associated with domestic burning. Factors such as seasonality, the availability and price of fuels as well as cultural aspects all have a bearing on residents' fuel choices and the quantity consumed.

11:00 "Black Carbon Emissions from Diesel Sources in Murmansk City and Murmansk Region of Russia," T. Kulkinski, US EPA; M. Evans, N. Kholod, S. Yu, Battelle; S. Tretyakova, V. Malyshev, E. Gusev and A. Barinov, MSTU

Black carbon (BC) is a potent pollutant because of its effects on climate change, ecosystems and human health. Black carbon has a particularly pronounced impact as a climate forcer in the Arctic because of its effect on snow albedo and cloud formation. We have estimated BC emissions from diesel sources in Murmansk Region and Murmansk City, the largest city in the world above the Arctic Circle. In this study we developed a detailed inventory of diesel sources including on-road vehicles, off-road transport (mining, locomotives, construction and agriculture), and fishing and diesel generators. For on-road transport, we conducted several surveys to understand the vehicle fleet and driving patterns, and, for all sources, we also relied on publicly available local data sets and analysis. We calculated that BC emission in Murmansk Region were 0.40 Gg in 2012. The mining industry is the largest source of BC emissions in the region, emitting 70% of all BC emissions because of its large diesel consumption and absence of emissions controls. On-road vehicles are the second largest source emitting about 12% of emissions. Old heavy duty trucks are the major source of emissions. Emission controls on new vehicles limit total emissions from on-road transportation. Vehicle traffic and fleet surveys show that many of the older cars on the registry are lightly or never used. We also estimated that total BC emissions from diesel sources in Russia were 56.7 Gg in 2010, and on-road transport contributed 55% of diesel BC emissions. Agricultural machinery is also a significant source Russia-wide, in part because of the lack of controls on off-road vehicles.

11:25 Open Forum

11:50 LUNCH

Session 3: Air Toxics

Chairs: Madeleine Strum, US EPA/OAQPS
Chun-Yi Wu, MPCA

8:00 "The 2011 National Air Toxics Assessment," M. Strum, T .Palma, A. Eyth, J. Thurman, S. Phillips, R. Mason, M. Morris, R. Cook, A. Zubrow and R. Scheffe, US EPA.

The National-Scale Air Toxics Assessment (NATA) is a modeling assessment which combines a detailed emissions inventory, atmospheric fate and transport modeling, exposure modeling, and health risk criteria to characterize the risks associated with inhalation of air toxics of outdoor origin. A national-scale effort has been conducted for the years 1996, 1999, 2002, and 2005, and included a nationwide characterization of the ambient levels and associated risks from hazardous air pollutants listed in Section 112 of the Clean Air Act plus diesel PM. The 2011 assessment is expected to be completed and released later in 2015. The analysis will include a series of improvements to the assessment methodology over past NATA analyses including: improvements to the national emissions inventory and source characterization including spatial and temporal allocation data and methods, and the use of a hybrid approach that utilizes a photochemical grid model and dispersion model to more accurately include chemistry and long range transport. This presentation will review the updated modeling methodology being utilized for the 2011 NATA and the process for the roll out of the results.

8:25 "Developing Modeling-Ready Emissions Inventory for MATES IV Study," S.-Mi Lee, X. Zhang, J. Cassmassi and P. Fine, SCAQMD/California.

The toxic emissions inventory for MATES IV consists of four components: (1) point sources; (2) area sources; (3) on-road mobile sources; and (4) off-road (or other) mobile sources. Point source emissions are from facilities having one or more pieces of equipment registered and permitted with the SCAQMD with emissions above certain threshold levels.

A point source emissions inventory was based on the emissions data reported by the point source facilities in the 2008 Annual Emissions Reporting (AER) Program. On-road emissions are estimated by combining emission factors with vehicular activity using emission factors from EMFAC2011. Link-based traffic volumes and speeds were obtained from the Southern California Association of Governments regional transportation modeling. The Direct Travel Impact Model (DTIM) was used to link emission factors and transportation modeling results and generate hourly gridded emissions of criteria pollutants. CARB's OFF-ROAD model was used to estimate emissions for all off-road categories.

A "top down" approach is used to develop the toxics inventory; that is, toxic emissions are calculated by applying the latest CARB speciation profiles to the hydrocarbon and particulate matter emissions. Speciation profiles provide estimates of the emission's chemical composition. The source type (e.g., equipment and fuel) is used to identify the appropriate speciation profile. As a result, a comprehensive spatially and temporally allocated toxics emissions inventory was developed for 2 km by 2 km grid photochemical modeling. Methods, as well as inventory and modeling results will be presented along with current work on inventory improvements.

8:50 "Emissions Inventory and Health Risk Assessment of Toxic Air Pollutants for the Canadian Lower Fraser Valley and Vancouver, British Columbia," D. Sullivan, Y. Du, S. Reid and M. McCarthy, Sonomatech; F. Ries and D. Jennejohn, Metro Vancouver.

Metro Vancouver (MV) and its stakeholders initiated a study in 2014 to develop updated information concerning toxic air pollutants (TAPs) in the Canadian Lower Fraser Valley (CLFV). The intent was to produce useful information for air quality managers, who must determine which specific TAPs or emissions sources may become subject to management actions. TAPs include volatile and semi-volatile organic compounds (VOCs, SVOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, and carbonyl compounds. They are associated with a wide variety of adverse health effects, including cancer, neurologic effects, reproductive effects, and developmental effects.

The study involved (1) a Health Risk Assessment (HRA) of TAPs and (2) an update of the regional TAP emissions inventory. For the HRA, ambient TAP data were analyzed and used to estimate associated health risks for the year 2010. Then, the regional TAP emissions inventory was updated, focusing primarily on TAPs identified as high priority during the HRA. Diesel particulate matter (PM) was found to be the dominant contributor to the total cancer risk and risk-weighted emissions in the CLFV. The next most important TAPs related to cancer risk were found to be formaldehyde, carbon tetrachloride, and wood smoke PM. Acrolein was the dominant TAP among chronic noncancer hazards. This paper will provide details about the methods and findings of the emissions inventory development, a brief summary of the findings of the HRA, and a discussion of the existing and planned air quality management policy outcomes arising from the emissions inventory and HRA results.

9:15 “Best Practices for Preparing Lead (Pb) Emission Inventories from Piston-Powered Aircraft,” J. Heiken, Sierra Research/Trinity.

Lead (Pb) is a well-known air pollutant that can lead to a variety of adverse health impacts, and in October 2008, the EPA promulgated a new Pb NAAQS that lowered the acceptable level by an order of magnitude. Because general aviation airports represent a significant source of lead emissions, the Airport Cooperative Research Program initiated project ACRP 02-34 – *Quantifying Aircraft Lead Emissions at Airports*, with the objective of reviewing and improving existing methodologies to quantify and characterize aircraft-related Pb emissions due to the use of leaded aviation gasoline. A product of this project was the preparation of “best practices” guidance for the preparation of Pb emission inventories from piston-powered aircraft.

The best practices guidance advances the science of piston aircraft inventory methods by expanding the database of aircraft fleet fuel consumption rates, refining methods for fuel rate assignment, expanding the types operating modes modeled and creating methods specific to rotorcraft. The guidance is supplemented with locally collected modeling inputs representing the aggregate of 3 candidate general aviation airports studied in ARCP 02-34. These inputs are provided for demonstration purposes as the airport-to-airport variation is significant. The following impacts in Pb emission inventory (3-airport aggregate) are estimated for the incremental changes in inventory methods:

- Incorporating magneto-test run-up procedures (+5%),
- Local aircraft fleet data and improved fuel rate assignment (-12%),
- Distinct continuous operation modes typical of training operations (-25%), and
- Locally observed gasoline Pb content (-25%).

9:40 BREAK

10:10 “2014 Portland Oregon Residential Wood Combustion Survey”, C. Swab, Oregon DEQ.

DEQ contracted with the Portland State University Survey Research Lab to perform a 2014 telephone survey on residential wood burning in the Portland metro area. This survey provides more current and refined data about wood burning, with the purpose of providing DEQ and community partners a better understanding of levels of wood burning emissions, their locations, and the most effective pollutant reduction strategies. The survey results, based on 1,061 residences surveyed, showed that 28% of the respondents burned wood in their homes. Five percent of those sampled reported burning wood as their primary source of heat. Compared to DEQ’s last figures on residential wood burning in the 2012 Portland Air Toxics Solutions project, the current survey shows that residents of the Portland region burn about 80% more wood than previously estimated. Much of this increase is due to improved accuracy in data for locations of wood burning. Previous estimates were much lower since regional results from a statewide survey were inaccurately distributed to the PATS study area. Overall, 5% of the residents who rely on wood as their primary source of heat burn 51% of the wood in the Portland area. Portland residents burn 56% of wood fuel in higher polluting uncertified devices (stoves and fireplaces) and 44% of wood in cleaner certified devices. Similar to other communities in Oregon, uncertified wood stoves, uncertified fireplace inserts and fireplaces emit the bulk of fine particulate from wood burning in the Portland metro area.

10:35 “Lessons Learned from the Residential Wood Combustion Surveys,” C-Y. Wu, L. Herschberger, D. Bael, M. J. Fenske and K. Palmer, MPCA.

For five decades residential wood burning and harvesting have been surveyed in Minnesota by forest management region. The densely populated Minneapolis/St. Paul metropolitan area has been surveyed separately from four less populated regions. These surveys have provided valuable information for characterizing and estimating emissions from residential wood combustion in Minnesota and have informed the emission estimates for other states in the nation. Survey-derived residential wood consumption estimates resulted in residential wood combustion accounting for a significant fraction of the anthropogenic PM2.5 emissions in Minnesota's air emission inventory.

The most recent survey studied a full year covering the 2011 - 2012 heating season. The questionnaire for the latest survey was redesigned to increase response rates and improve the validity of the results, in particular for the Twin Cities metropolitan area. To expand the usefulness of the survey results and guide future survey design, it is important to evaluate the quality of the data available from the surveys and identify additional improvements that can be made. This paper presents a brief description of the MN 2011/2012 survey and results, and qualitatively compares the findings with historical surveys. Results from recent surveys provide evidence that outdoor recreational wood burning at home is an important and likely increasing, though often unrecognized and rarely addressed, source of air pollution. The evolution of the surveys is described along with some important factors influencing the validity and reliability of the estimates. Suggestions for possible future survey improvements are offered.

11:00 “Toxics Release Inventory Data and Tools - Updates and Activities Worthy of Notice,” S. Witkin, US EPA.

The primary purpose of the Emergency Planning and Community Right-to-Know Act (EPCRA) is to inform communities and citizens of chemical hazards in their areas. The Toxics Release Inventory (TRI), under EPCRA, is a publicly available EPA database containing information on toxic chemical releases and waste management activities on nearly 630 chemicals and chemical categories. The last two years saw a number of changes and events, making the TRI dataset a more powerful tool in the arsenal for building and using emissions inventories. One of the largest legal settlements involving failure to submit timely, complete and correct TRI reports was recently finalized. This action highlights the fact data reported by a facility should not be automatically viewed as low quality. Violators are identified and do face legal penalties. A second major recent achievement is a significant reduction in data gaps with facility spatial data. This data gap shrunk from around 3% per year to 0.1 %. Success was due to the diligent work of data stewards matching TRI facilities with other records in EPA's Facility Registry System (FRS) and a lot of boots on the ground making site visits. TRI has also launched a new Pollution Prevention (P2) tool. The value added with this tool is the ability to associate specific P2 activities taken by a facility with changes in their emissions. New chemicals and changes with existing tools round out this set of TRI updates.

11:25 “The Toxics Release Inventory and Emissions Reduction Measures,” D. Teitelbaum, US EPA.

EPA's Toxics Release Inventory (TRI) Program collects a wealth of standardized multimedia environmental information from over 20,000 industrial facilities each year. The TRI's unique combination of quantitative and qualitative information makes it a valuable resource for tracking environmental progress and identifying sustainable practices that have led to measureable improvements.

With respect to air toxics, TRI collects information on both emission quantities and the source reduction and pollution control measures that facilities have undertaken to reduce them. Since 2012, EPA has taken steps to enhance TRI data on emission reduction measures and to make these data more accessible, meaningful, and intelligible. To this end, TRI’s new Pollution Prevention (P2) Search Tool (available at www.epa.gov/tri/p2) allows users to identify practices that have contributed to the largest decreases in emissions and to graphically compare facilities and companies using a variety of environmental metrics from both TRI and the Greenhouse Gas Reporting Program (GHGRP).

This paper describes the information and insights offered by the TRI P2 Tool with respect to air toxics. It also examines the relative and cumulative impacts that different P2 techniques have had on emissions using a statistical technique known as a differences-in-differences approach.

11:50 LUNCH

Session 1: EI Preparation - continues

Chairs: Alison Eyth, US EPA/OAQPS
Wayne Boulton, RWDI

1:20 "Competing Source Emission Inventories for Air Quality Analysis," B. Albertson, OR Dept. of Environmental Quality

An air quality analysis is required in Oregon when emissions from new or modified sources are greater than Significant Emission Rates. In addition to the new or modified source, dispersion modeling may require the inclusion of emissions from nearby competing sources to ensure air quality standards will not be violated. Good quality emissions data for these competing sources are not always available to sources or consultants performing the analysis.
Oregon Department of Environmental Quality (ODEQ) currently prepares competing source emission inventories for the analysis because emissions and permitting information are already available at the agency in electronic or paper format. However, there is no formal guidance available for selecting which sources to include and the level of emissions information to incorporate into each inventory. ODEQ prepares the inventories on a case-by-case basis for each project but a more common approach is warranted in order to standardize the methodology and provide a more consistent and transparent process.

The purpose of this paper is to describe a formal process for developing competing source emission inventories. The paper will discuss the development of selection criteria to determine which sources to include in the inventories. Specifically, these criteria may include competing source emission rates and distances, emission timing, pollutant averaging time, concentration gradients, meteorology, topography, and other factors.

1:45 "Forecasting Emissions in California," G. Ruiz, A. Griffin, G. Wang, C. Wang, L. Hunsaker and A. Huang, California Air Resources Board.

Meeting federal air quality standards and climate goals require comprehensive emission forecasting methods. These forecasting methods must reflect the expected impact of socioeconomic trends as well as the benefits of the California emission reduction control program. This paper will present the methods ARB uses to grow GHG and criteria emissions into the future across the State.

California has the unique authority that allows the State to develop emission controls for mobile sources. In support, ARB has been estimating emissions from mobile sources for many years using emission estimation models. More recently, ARB developed EMFAC2014 which forecasts on-road mobile source emissions using econometric models that forecast California fuel consumption and new vehicle sales. These econometric models base forecasts on the relationship between historical fuel and vehicle sales data and California-specific socioeconomic parameters. EMFAC2014 also accounts for the benefits of California mobile source control programs.

For point and area-wide sources, ARB tailors the growth profiles to be appropriate for each point and area-wide source category based on two criteria: the growth surrogates that are known to correlate well with the emitting activity and that the data and projection method are robust. ARB uses growth profiles derived from economic and demographic forecasts, trends expected in factors such as fuel usage rates and population density, and source specific history. Examples of the types of data ARB uses include census data, local planning agency information, agriculture reports and state fuel trends. The forecasted projections include the benefits of regional source-specific controls.

2:10 "Air Pollutant Emissions Modeling and Analysis for the Three-State Air Quality Study," Z. Adelman, M. Omary, D. Yang, UNC Institute for the Environment; R. Morris, A. Bar- Ilan, T. Shah and J. Grant, ENVIRON and T. Moore, Western Governors Association.

The Three-State Air Quality Study (3SAQS) is intended to facilitate air resource analyses for federal and state agencies in the states of Wyoming, Colorado, and Utah toward improved information for the public and stakeholders as a part of the National Environmental Policy Act (NEPA) and potentially other studies. The main focus of the study is on assessing the environmental impacts of sources related to oil and gas development and production. In particular, the study cooperators will use photochemical grid models (PGMs) to quantify the impacts of proposed oil and gas development projects within the 3SAQS region on current and future air quality, including ozone and visibility levels in the National Parks and Wilderness Areas. Improvements to the emissions estimates for oil and gas, agricultural, and other key sources of air pollution are being made as part of the 3SAQS. In particular, bottom-up oil and gas source inventories are being fused with data from top-down inventories to improve the representation of VOCs and NOx from these sources. Information on the locations of confined animal feeding operations (CAFOs) is being used to improve the spatial allocation of ammonia from livestock sources. Diagnostic analyses of PGM evaluation results are also being used to adjust the emissions data to improve the fidelity of the model with surface observations. This paper describes the inventories and emissions data used for the 3SAQS, shows inventory comparisons between the model years (2008, 2011, 2020), and describes the types of analyses being used to diagnose and improve deficiencies in the emissions data.

2:35 "Baseline Emissions Inventory and Future Year Projections for the Arctic Air Quality Modeling Study," P. Fields Simms, M. Wolf, R. Billings, M. Pring, R. Oommen and D. Wilson, ERG; H. Crowley and V. Raps, Bureau of Ocean Energy Management.

The Bureau of Ocean Energy Management (BOEM) is assessing air quality impacts from offshore oil and gas exploration, development and production on the Alaska Outer Continental Shelf (OCS), as well as those in near-shore state waters, and related onshore activities. For this assessment, BOEM is sponsoring the Arctic Air Quality Impact Assessment Modeling Study (Arctic AQ Modeling Study), including developing a bottom-up emissions inventory of impacting sources located on the North Slope of Alaska, evaluating detailed meteorological data sets, and conducting far- and near-field photochemical and atmospheric dispersion modeling.

This paper provides details on the development of the baseline and projected emissions inventory for use in the air quality models. Emissions of criteria air pollutants, greenhouse gases, and hazardous air pollutants from anthropogenic sources (i.e., offshore oil/gas production, stationary sources located in North Slope communities, onroad motor vehicles, nonroad equipment, marine vessels and airports) were estimated. Emissions that could reasonably be expected to occur in the future under a "full-buildout" scenario were also estimated, based on potential future levels of increased oil and gas production activities to be conducted on the North Slope. Results were vetted through BOEM and a Science Review Group to ensure emissions were estimated according to the established protocol, and documentation was transparent and accurate. GIS data sets and temporal profiles are currently being developed to allocate emissions spatially and temporally for use in the air quality photochemical and atmospheric dispersion models.

3:00 BREAK

Session 2: Global/International Issues - continues

Chairs: Rebecca Tooly, US EPA/OAQPS
Greg Frost, NOAA

1:20 "North American Black Carbon Emissions Estimation Guidelines," J. Koupal, P. Fields Simms and G. Manne, ERG and O. Cabrera-Rivera, Commission for Environmental Cooperation.

The Commission for Environmental Cooperation (CEC) and Eastern Research Group, Inc. (ERG) are currently developing black carbon emission estimation guidelines for North America, to be finalized in spring 2015. These guidelines are intended to provide a consistent methodology for developing black carbon inventories between the U.S., Mexico and Canada, in order to improve cross-border comparisons and mitigation assessments. The guidance will also provide recommendations for further research to align the capabilities of the three countries, with a special focus on Mexico. The first stage of the project included a literature review and comparative evaluation of black carbon and underlying particular matter emission inventory methods and data sources in North American, Europe and Asia. This evaluation culminated in a series of recommendations for "best practice" approaches by major sector (mobile, open burning, residential, energy/industrial and other) and alternatives where best practice is not feasible in the short term. An expert panel was then convened to review and provide comments on these initial recommendation to ensure consensus on the proposed methods and data sources. Based on this initial work and expert panel input, the guidelines are now being compiled to fill in specific sources of emission factors, activity and speciation factors, with the goal of providing sufficient detail to allow inventory developers across North America to construct black carbon emissions inventories for all sectors. The presentation will provide an overview of recommendation for each sector, and review the literature search, evaluation and expert panel process which contributed to the guidelines.

1:45 "Black Carbon Emissions from Biomass Burning in Northern Eurasia from 2002 to 2012," W. M. Hao, A. Petkov, B. Nordgren, R.E. Corley, and S. P. Urbanski, U.S. Forest Service.

Black carbon (BC) in smoke plumes in Northern Eurasia may be transported and deposited on Arctic ice and accelerate ice melting during certain times of the year. Thus, we examined daily BC emissions from fires in this region at a 500 m x 500 m resolution from 2002 to 2012. Black carbon emissions were estimated based on MODIS land cover maps and detected burned areas, the Forest Inventory Survey of the Russian Federation, and emission factors of BC for different types of vegetation fires. Annual burned areas in Northern Eurasia varied considerably with an average of 2.6 × 105 km2 for the study period. Grassland dominates the total burned area (61%), followed by forest (27%). For grassland fires, about three-quarters of the area burned occurred in Central and Western Asia and about 17% in Russia. More than 90% of the forest burned area was in Russia. Annual BC emissions from fires varied enormously with an average of 8.5×108 kg. In contrast to burned area, BC emissions from forest fires accounted for about two-thirds of the emissions, followed by grassland fires (15%). More than 90% of the BC emissions from forest fires occurred in Russia. Central and Western Asia is the major region for BC emissions from grassland fires (53%). Overall, Russia contributed 83% of the total BC emissions from fires in Northern Eurasia. These results are critical in understanding future climate impacts on fire regimes in Northern Eurasia and the contribution of black carbon to accelerated melting of Arctic ice.

2:10 "Using Satellite Observations to Detect and Quantify Large Emission Sources Worldwide," D. Streets and Z. Lu, Argonne National Laboratory.

In the past two decades, major advances have occurred in the detection of atmospheric pollution from space. The generation of satellite instruments launched since 1995 has proved to be capable of observing a wide range of chemical species at increasingly high spatial and temporal resolution. In addition, the transformation of raw satellite retrievals to user-friendly, archived products has progressed considerably, such that the application of satellite observations to a wide range of atmospheric problems is becoming routine. In many parts of the world and for many chemical species, emission inventories are not as reliable as we would like, and now that satellites can detect pollution over wide areas with daily resolution, there is great potential for adding satellite retrievals to the toolbox for emission inventory development. This is one of the topics being addressed by NASA's Air Quality Applied Sciences Team (AQAST), a group of researchers convened to address how Earth science research and methods can be applied to air quality management. This paper reviews some of the successes and opportunities for detection and quantification of emissions from large anthropogenic point sources around the world. Much of the work derives from the Ozone Monitoring Instrument (OMI) on the Aura satellite, which today provides one of the most widely used retrievals. Building on early detection of SO2 emissions from copper smelters in Peru and the Norilsk smelter complex in Russia, recent advances in detection of NOx and SO2 emissions from power plants in China and India are discussed.

2:35 "Inter-Comparison of Different NOx Emission Inventories and Associated Variation in Simulated Surface Ozone (O3) in Indian Region," S. Ghude, C. Jena, D.M. Chate and G. Beig, Indian Institute of Tropical Meteorology; R. Kumar and G.G. Pfister, National Center for Atmospheric Research.

In this work, we compare for the first time different anthropogenic NOx emission inventories and examine the associate variation in surface ozone (O3) in India. A total of six anthropogenic NOx emission inventories namely Emission Database for Global Atmospheric Research (EDGAR), Intercontinental Chemical Transport Experiment-Phase B (INTEX-B), Regional Emission Inventory in Asia (REAS), MAC City, Indian National Emission Inventory (India_NOx), and Top-Down NOx emission inventory for India (Top-Down) are included in the comparison. We include these emission inventories in regional chemical transport model WRF-Chem to simulated tropospheric column NO2 and surface O3 mixing ratios for the month of March and December in 2005. Predicted tropospheric column NO2 using different NOx emission inventory (both bottom-up and top-down) are evaluated with the OMI satellite observations. All emission inventories show similar spatial features, however uncertainty in NOx emissions distribution is about 20 -50% over rural regions and about 60-160% over the major point sources. Compared to OMI observations, the largest bias in simulated tropospheric NO2 columns is seen in the REAS (-214 ± 284 × 1013 molecules cm-2) emission inventory, followed by EDGAR (-168 ± 266 × 1013 molecules cm-2), MAC City (-139 ± 223 × 1013 molecules cm-2), INTEX-B (-83 ± 179 × 1013 molecules cm-2) and India_NOx (-57 ± 119 × 1013 molecules cm-2) inventories. Simulations using different NOx emission inventories produces maximum deviation in ozone of the order of 9-17 ppb (15 – 40%) and 3 -12 ppb (5 - 25%) over most of the land area during March and December, respectively. The simulation suggests that choice of NOx emission inventories have significant effect on O3 surface concentration for air quality studies over India.

3:00 BREAK

Session 4: GHG Emissions Including Methane and Black Carbon

Chairs: Leif Hockstad, US EPA/OAP
Melissa Weitz, US EPA/OAP

1:20 "A Gridded (0.1 degree x 0.1 degree) Monthly Resolved Version of the U SEPA National Methane Emissions Inventory for use as Apriori and Reference in Methane Source Inventories," J. Dyonisius, J. D. Maasakkers, D. J. Jacob, A. J. Turner and M. P. Sulprizio, Harvard University; T. Wirth and C. Hight, US EPA; A. A. Bloom, Jet Propulsion Laboratory/CalTech.

Allocation of US methane emissions by source types and regions is highly uncertain. Top-down analyses have generally used EDGAR as anthropogenic prior as it provides finely gridded global data. However, EDGAR follows the relatively crude Tier 1 IPCC methods that estimate emissions using basic national or international activity data combined with default emission factors. The EPA inventory of US greenhouse gas emissions follows more complex IPCC Tier 2/3 approaches and uses more detailed activity data and emission factors. Evaluating and improving the bottom-up inventories on the basis of top-down analysis requires information on the spatial distribution of different source types but the EPA inventory is presently only available as national totals for most sources.

In this research, we create a directly evaluable gridded version of the US EPA national bottom-up inventory for methane. We convert the EPA methane emission inventory into a $0.1° \times 0.1°$ gridded monthly emission inventory for the US domain and individual years, suitable for direct evaluation with top-down constraints. For example, our gridded emission estimates from livestock are based on EPA emission data per state, USDA livestock inventories per county, and USDA weighted land cover maps for sub-county localization. Furthermore, we incorporate large individual point sources reported through the EPA Greenhouse Gas Reporting Program. We find significant differences in the spatial patterns of emission sources compared to EDGAR v4.2. Our inventory improves comparability between top-down methods and bottom-up inventories and can advance understanding of the factors controlling methane concentrations and their trends.

1:45 "Near-Term Climate Mitigation by Short-Term Forcers," S. Smith, PNNL.

Forcing agents with relatively short atmospheric lifetimes, short-lived climate forcers (SLCFs), are an attractive mitigation target since they offer the prospect of reducing near-term anthropogenic climate change. Much of the work in this area has focused on black carbon and methane. The potential for near-term climate mitigation by SLCFs is reviewed and shown to be relatively modest (Smith and Mizrahi 2013). Climate and atmospheric inertia reduce the near-term SLCF mitigation potential well below equilibrium values. SLCF mitigation potential has a high uncertainty, which is also assessed. A large portion of this uncertainty is due to uncertainty in carbonaceous aerosol emissions and aerosol forcing in general.

2:10 "Impact of Changes in Barometric pressure on Landfill Methane Emissions," L. Xu, J. Amen, D. McDermitt, Li-COR Biosciences; X. Lin, LI-COR Biosciences and Kansas State University; K. Welding, Bluff Road Landfill, Nebraska.

Landfill methane emissions were measured continuously using the eddy covariance method from June to December 2010. The study site was located at the Bluff Road Landfill in Lincoln, Nebraska, USA. Our results show that landfill methane emissions strongly depended on changes in barometric pressure; rising barometric pressure suppressed the emission, while falling barometric pressure enhanced the emission, a phenomenon called barometric pumping. There was up to a 35-fold variation in day-to-day methane emissions due to changes in barometric pressure. Power spectrum and ogive analysis showed that at least 10 days of continuous measurements was needed in order to capture 90% of the total variance in the methane emission time series at our landfill site. From our results, it is clear that point-in-time measurements taken at monthly or longer time intervals using techniques such as the trace plume method, the mass balance method, or the closed-chamber method will be subject to large variations in measured emission rates because of the barometric pumping phenomenon. Estimates of long-term integrated methane emissions from landfills based on such measurements could yield uncertainties, ranging from 28.8% underestimation to 32.3% overestimation. Our results demonstrate a need for continuous measurements to quantify annual total landfill emissions. This conclusion may apply to the study of methane emissions from wetlands, peatlands, lakes, and other environmental contexts where emissions are from porous media or ebullition. Other implications from the present study for hazard gas monitoring programs are also discussed.

2:35 "Use of Historical Measurements to Constrain BC Emission Inventory of the United States from 1960s to 2000s," T. Sun, L. Liu, T. C. Bond, University of Illinois/Urbana-Champaign, M. Flanner, University of Michigan—Ann Arbor, T. W. Kirchstetter, Lawrence Berkeley National Laboratory, C. Jiao, University of Michigan—Ann Arbor, C. V. Preble, Lawrence Berkeley National Laboratory, and W. Chang, University of Illinois/Urbana-Champaign.

We use historical coefficient of haze measurements in California and New Jersey to constrain the black carbon (BC) emission inventory for 1960s-2000s. We study the relationship between emissions and ambient air concentrations of BC using the Community Atmosphere Model. When formulating the relationship into matrices that allow reconstruction of ambient concentration with emission inventory, we account for the error in model meteorology and adjust it with measurements from NASA. We also apply Heating Degree Days (HDDs) data to estimate seasonal variation in emissions, as observed from the concentrations. However, HDDs does not fully explain the seasonal variation trend of the measurement.

Potential errors in historical emissions are identified by analyzing discrepancy between reconstructed and measured BC. Acknowledging the resolution difference between the reconstructed concentrations based on global model simulation and the urban measurements, we rely more on the discrepancies in trends than that in absolute discrepancies. We find that the magnitude of observations was decreasing throughout this period of time, while the reconstructed concentrations peaked in the 1980s. The fuel uses and emission factors for each technology division and sector of BC emission inventory in SPEW (Speciated Pollutant Emissions Wizard) are analyzed to address the error indication from the measurements. A modified emission inventory for the period 1960-2000 is presented.

3:00 BREAK

3:30 "Petroleum and Natural Gas Systems Greenhouse Gas (GHG) Emissions: Comparison between the GHG Inventory and the GHG Reporting Program," M. Lev-On, The LEVON Group; K. Ritter, American Petroleum Institute; and T. Shires, URS Corporation.

Due to the dynamic nature and growth of the petroleum and natural gas industry sectors, understanding their greenhouse gases (GHG) emission trends is not always straightforward. The two EPA programs that are providing information about GHG emissions in the U.S. include the national GHG inventory, which is being submitted annually to the United Nations under the terms of the ratification of the Framework Convention on Climate Change. The other – a more recent program - is the mandatory GHG reporting program (GHGRP) that collects GHG emissions data at the facility level from 41 sectors of the economy. For the national GHG inventory, the EPA continues to incorporate new information, as it becomes available, and it is making increased use of the data from the GHGRP to improve and refine the national inventory. Still, the GHGRP data covers only a subset of national emissions from facilities having total annual emissions of 25,000 metric tons carbon dioxide equivalent or more.

The American Petroleum Institute (API) has been engaged for over a decade in improving methodologies for estimating GHG emissions from oil and natural gas industry operations. This paper will compare and contrast segment boundaries, methodologies and calculated GHG emissions for what is classified as 'Petroleum and Natural Systems' under the two EPA programs. It will highlight similarities and differences and the analysis will point out the source of differences of the emissions calculated under these programs and provide recommendations for ensuring improved data comparability.

3:55 "Rapid Identification of Location and Magnitude of Urban Natural Gas Leaks," J. C. von Fischer and J. Ham, Colorado State University.

The few studies to quantify emissions of natural gas from urban distribution pipeline leaks have found them to be highly variable within and among cities. Yet understanding the location and magnitudes of these leaks are important for minimizing greenhouse gas emissions and informing public discussions about investment in pipe repair and replacement. We developed automated data collection and analysis algorithms based on controlled release experiments, and then mapped urban street-scale patterns in atmospheric methane and using the algorithms identified the location and scale of the observed leaks. Our data suggest that an automated leak survey system can reliably document patterns in leak location and magnitude. Mobile monitoring of methane leakage from in street local distribution pipes can provide the quantitative data needed to develop more effective strategies for minimizing leakage over the short term and prioritizing pipe replacement over the longer term.

4:20 "Top-Down Estimate of Methane Emissions in California using a Mesoscale Inverse Modeling Technique," Y. Cui, J. Brioude, S. McKeen, W. Angevine, S. Kim, G. J. Frost and J. Peischl, NOAA/CIRES-University of Colorado, Boulder; Z. Liu, Combustion Research Facility, Sandia National Laboratories; T. Ryerson and M. Trainer, NOAA; and S. C Wofsy, Harvard.

Methane (CH4) is a primary component of greenhouse gases and has a large global warming potential. Statewide top-down emissions estimates of CH4 in California deduced from observations have been found to be greater than bottom-up state inventories. Therefore, there is a critical need to quantify CH4 emissions in California to benefit climate future projections and potential mitigation actions. In this work, we quantify CH4 emissions at <10 km spatial resolution with a mesoscale inverse modeling system, which includes a Lagrangian particle dispersion model driven by the Weather Research and Forecasting model (FLEXPART-WRF), airborne measurements (CalNex 2010), and a hybrid inventory (based on NEI 05&11, EDGAR, CARB, and CALGEM). For the L.A Basin, we use this system to estimate a posterior inventory based on daytime measurements of six flights. The total emission of CH4 in L.A. Basin calculated in this study is consistent with previous top-down studies, as are our emissions for the dairy sector in the Basin. The inverse system is also used to study CH4 surface fluxes in the Central Valley, which presents a challenge to atmospheric transport simulations due to the complex terrain. Taking advantage of the spatial coverage of airborne measurements, we use six daytime flights each to estimate CH4 emissions over San Joaquin Valley and Sacramento Valley, respectively. This presentation will focus on spatial distributions of CH4 surface fluxes in Central Valley and discuss the role of the main emission sectors in this area that contribute to the discrepancies between our top-down calculations and bottom-up inventories.

4:45 "Cross Verification of GHG Inventory with NEI Data," K. Narasimhan, VA DEQ

In this presentation, greenhouse gasses (GHG) emissions estimated from a top-down approach as from the State Inventory Tool (SIT) provided by the Environmental Protection Agency (EPA) are independently verified with emissions computable on the basis of activity data within the National Emission Inventory (NEI) system guided by the facts that: (a) More than 90 percent of the GHG emissions are attributable to energy sector (both production and usage of fossil fuels) along with some industrial processes like cement, steel, lime, chemicals manufacture; (b) Very activities contributing most of such GHG also emit criteria pollutants covered by NEI. For the purpose of demonstration, GHG emissions from the state of Virginia for 2011 estimated using SIT are tallied with that computed on the basis of activity data in NEI database for point, non-point, non-road (version 2) and on-road sources. All GHG from on-road sources and CO2 from non-road sources are readily available from NEI. Other emissions are computed based on the corresponding activity data. Results show that the GHG emissions estimated by either method tally in general. At the same time, the process also reveals some specific differences in the input data used in one method compared with that of other pointing to specifics that may need verification for data quality check. Besides, GHG emissions arrived at on the basis of NEI data can easily be dovetailed to county level. Ways to make the verification more comprehensive are also discussed.

Session 5: Biomass Burning

Chairs: Sean Raffuse, Sonomatech
Sim Larkin, USDA US Forest Svc
Tesh Rao, US EPA/OAQPS

3:30 "Developing Agricultural Burning Emissions Inventories to Support the Quantification of Fire-Related Ozone Impacts for an Exceptional Event Demonstration," K. Craig, Y. Du, and S. Reid, Sonoma Technology; T. Gros and D. Watson, Kansas Department of Health and Environment.

Each spring, ranchers and farmers in the Kansas Flint Hills region burn approximately two million acres of grasslands. These annual burns are a longstanding land management practice; however, air quality impacts from smoke generated by these fires have gained more attention in recent years. In April 2011, widespread smoke from numerous fires in the Flint Hills and from other large fires in Texas and Mexico impacted air quality in Kansas and coincided with exceedances of the National Ambient Air Quality Standards (NAAQS) for ozone.

The Community Multiscale Air Quality Model (CMAQ) was used to quantify the ozone impacts due to emissions from the Flint Hills fires during April 2011. To support this analysis, we developed an agricultural burning emissions inventory for the Flint Hills using the BlueSky Smoke Modeling Framework. To ensure appropriate plume rise characteristics for the fire emissions, we developed a refined temporal and spatial allocation approach that combined county-level burn acreages, local fuel loadings, burn size distributions, and sub-county spatial burn distributions developed from local knowledge of the vegetation and typical burning practices in the Flint Hills. The modeled impacts on peak 8-hr average ozone on the exceedance days ranged from 5 to 30 ppb at the Kansas monitoring locations. The modeling analysis helped demonstrate that NAAQS exceedances on April 6, 12, and 13 would not have occurred "but for" the Flint Hills fires. The Kansas Department of Health and Environment presented these findings to the U.S. Environmental Protection Agency in an exceptional event demonstration package.

3:55 "Georgia Wildland Fire Emissions and Their Air Quality Impacts," D. Tian, T. Zeng and J. Boylan, GA DNR.

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). In 2011, wildland fires in Georgia emitted 132,866 tons of PM2.5 (50% of total anthropogenic PM2.5 emissions). Unlike in the western U.S., most wildland fires in Georgia are prescribed fires which are ignited intentionally for ecosystem health. In this work, uncertainties in the Georgia 2011 wildland fire emissions are first investigated, and then possible improvement options are presented. This information will be used to guide the development of the Georgia 2014 wildland fire emission inventory. In addition, impacts of Georgia wildland fire emissions on State Implementation Plan (SIP) modeling are explored in the context of model performance evaluation, attainment demonstration, and control strategy development. Better understanding of the air quality impacts from wildland fires is greatly desired with the implementation of the more stringent 2008 ozone and the 2012 PM2.5 National Ambient Air Quality Standards.

4:20 "Crop Residue Burning in the 2014 National Emissions Inventory," G. Pouliot and V. Rao, US EPA; J. McCarty, Michigan Technological Institute; and A. A. Soja, NASA.

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 sector of the National Emission Inventory, crop residue burning, has been difficult to characterize. Efforts have been made in previous national inventories to estimate this sector but uncertainties remain. In this paper, we will summarize the method used to estimate emissions for the 2014 NEI, discuss current uncertainties in the method, and provide crop specific average annual profiles based on a multi-year emission inventory. The main areas of uncertainty include identification and location of crop residue fires; estimating acres burned, and temporal allocation. Emission factors and fuel loadings for emission calculations also contribute further uncertainty. We will provide rationale for the methods used by EPA to develop inventories for this sector.

4:45 "An Update on Emissions Factors for Biomass Burning Emissions Inventory Purposes," S. O'Neill, S. Urbanksi, N. K. Larkin, and M. Rorig, USDA Forest Service, J K. Vaughan, B. K. Lamb, and S. Chung, Washington State University.

Recent efforts have developed a large number of new laboratory and field observations of emissions factors useful for biomass burning. These emissions factors show significantly different flaming, smoldering, and residual emissions rates from those used in many current models (e.g. CONSUME, FOFEM, FEPS). While it had been hoped that these new emissions factors would be incorporated at this time into newer versions of these models, questions have arisen about how best to apply these new emissions factors in such a way that they have maximal applicability and utility. Specific questions include: what are the causes of the differences with previous work; how should the emissions factors be applied (e.g. regionally, nationally); and how do we apply the emissions factors such that various emissions reduction techniques are not aggregated together. A working group is currently investigating these issues, and has hope to provide guidance in time for the final 2014 National Emissions Inventory effort.

Session 6: Agricultural Emissions

Chairs: Rhonda Thompson, US EPA/OAQPS
Peter Adams, Carnegie Mellon University

3:30 "Building a Processes Based Model for Livestock Emissions," M. Janssen, LADCO and M. McCourtney, MPCA

This presentation will outline the process and results of building a process based model for estimating emissions of ammonia from livestock. The model looks at all the physical processes involved in the emissions from livestock. It will examine the complexities of characterizing the physical properties of modern farming practices and how those processes effect emissions. The paper will examine which factors are most influential in the estimation of ammonia emissions and explore the results of running the model. Finally the paper will review areas where further work needs to be done to improve estimates.

3:55 "Development of a Province-Wide, Source-Specific, and Spatially-Resolved Agricultural Air Emissions Inventory," W. Boulton, C. McClellan, T. Task and M. Sawycky, RWDI and J. Foyle, BC Ministry of Agriculture/Canada

This paper describes a methodology adopted to complete a spatially and temporally resolved air emission inventory of agricultural sources in British Columbia (BC) for the BC Ministry of Agriculture (AGRI). This inventory can be distinguished from other regional, provincial and federal inventories in Canada as it is sector-based and strives to include sources related to agricultural activities not typically quantified. Emissions are derived from, and calculated at, the smallest census geometry levels available using different geospatial inputs and activity data for different sources and in different parts of the province.

Emission sources are grouped into six categories: organic material; fuel consumption and storage; energy use; burning; soil and amendments; and, soil and cropping emissions. Methodologies used to quantify emissions for similar sources in other jurisdictions across North America and elsewhere were reviewed and adapted for BC. Geographic Information System (GIS) software and data manipulation techniques were used to assess and reconcile geospatial activity data to arrive at most source-representative inputs available, such as sub-parcel land use designations contained within the province's AGRI Agricultural Land Use Inventory system. The underlying goal was to produce an emissions inventory at the Census Consolidated Subdivision (CCS) level where data availability made this possible. The result is a province-wide, source-specific emissions inventory generated at the most spatially-resolved level possible.

4:20 "Modeling Livestock Ammonia Emissions in the United States: From Farms to Emissions to Particulate Matter," A. McQuilling and P. Adams, Carnegie Mellon University.

Ammonia is a critical air pollutant, and its emissions from livestock production have been historically difficult to characterize due to their variability resulting from differences in manure management, nutrition, and meteorology. Based on the earlier work of Pinder et al. [1], we have developed process-based farm emission models (FEMs) for beef, swine, and poultry emissions, and constrained by literature data and evaluated against the recent National Air Emissions Monitoring study (NAEMS). The FEMs allow us to capture seasonal and regional variability in ammonia emissions due to varying climate and manure management practices between farms by using a nitrogen mass balance to track the total ammoniacal nitrogen (TAN) through the system. The FEM uses tuned parameters to ensure the emission factors produced by the model are consistent with literature-reported emissions. The FEM captures 30% of seasonal variability for broilers and 50-90% of the seasonal variability in the other animal types for NAEMS farms, with similar performance for literature-reported emission factors. Next steps in this work involve producing a process-based ammonia emission inventory accounting for the distribution of manure management practices for state and for each animal type—beef, swine, and poultry. By combining the results from the FEMs and the national practices, we are working toward producing inventories for major livestock types that capture seasonal and regional variability. The new inventory will be evaluated against current model inventories as well as recent ambient monitoring campaigns like the Ammonia Monitoring Network and the National Atmospheric Deposition Program.

4:45 "Ammonia Emissions from Western Livestock Lagoons," R. H. Grant and M. T. Boehm, Purdue University

Ammonia emission inventories for from livestock waste lagoons across the USA are generally based on chamber studies that do not include the influence of actual meteorological conditions on the exchange between lagoon or basin surfaces and the atmosphere. Ammonia (NH3) emissions from waste lagoons or basins were measured periodically for two years at swine and dairy operations across the United States as part of the National Air Emissions Monitoring Study. Path-integrated NH3 concentrations were measured using tunable diode lasers with emissions determined from on-site turbulence measurements in conjunction with inverse dispersion and integrated horizontal flux models. Emissions from dairy and swine operations in the western US were influenced by wind speed, animal live mass, and air temperature. Average daily emissions from sow and finishing farm waste lagoons in OK were similar with annual average daily mean emissions of 130 g d-1AU-1 (1 animal unit, AU=500 kg) and mean summer average daily mean emissions of 285 g d-1AU-1 of lagoons with continuous filling and no liquid or sludge removal. A semi-empirical model based on daily mean air temperature and daily mean wind speed accounted for 75% of the daily emission variability at the two lagoons. The corresponding emissions during filling of basins at an open-lot dairy in WA were between 5 and 13 g d-1AU-1. Emissions varied at the dairy between lagoon filling and the dry down and sludge removal. Ammonia emissions averaged 7 g d-1AU-1 across the entire 280-d handling cycle between fill and removal of waste from the basin.

Thursday Morning – April 16, 2015

Session 7: Mobile Sources

Chairs: Gary Dolce, US EPA/OTA
Alexis Zubrow, US EPA/OAQPS
John Koupal, ERG

8:00 "Impact of MOVES2014 on Emission Inventories from On-road Mobile Sources," D. Sonntag, M. Beardsley, D. Choi, C. Dresser, and E. Nam, US EPA.

The Environmental Protection Agency has recently updated the mobile source emissions inventory model with the release of MOVES2014. This presentation will compare highway-vehicle emission inventories produced with MOVES2014 to those produced with the EPA's previous MOBILE2010b model. Emission inventory differences for key mobile-source pollutants (including VOC, NOx and PM) will be quantified for three US cities, comparing the results of MOVES2014 to those from MOVES2010b using identical inputs of vehicle activity (e.g. vehicle miles traveled, average speed, vehicle population), fuels, and meteorology data.

8:25 "SMOKE-MOVES2014 Integration Tool Development," B. H. Baek and C. Seppanen, UNC- Institute for the Environment; A. Zubrow and A. Eyth, US EPA.

Since the first SMOKE-MOVES Integration tool released in 2010, the Motor Vehicle Emission Simulator 2010 (MOVES2010) emission factor calculations has been successfully implemented for regional air quality modeling system. In 2014, the newer version of MOVES has been released including various significant changes, especially in air quality modeling support. The items are following: (1) New Source Category Code (SCC) based on fuel types, vehicle types, road types and process types, (2) New SCC-8 level activity inventory data (i.e., VMT, VPOP, and HOTELLING), and (3) New chemical mechanism-specific model species emissions factors outputs from MOVES2014. To support these changes in MOVES2014, the latest SMOKE version 3.6 has been released in November 2014 along with updated MOVES driver script and MOVES post-processing scripts, which are parts of SMOKE-MOVES2014 integration tool. Although there has been only a minor update made in MOVES driver script, MOVES post-processing scripts have been significantly modified to support these changes in MOVES2014 including a few new features that allow users to optionally create new pollutants using a new pollutant formula file, and aggregate processes. This paper will provide the detail information about how these updates are made in SMOKE v3.6 and MOVES processing scripts, and what kinds of updates users need to make for a proper transition from MOVES2010b to MOVES2014 for regional air quality modeling.

8:50 "MOVES2014 Emissions Using Day-Specific Hourly Meteorology Compared With Monthly Average Meteorology," A. Zubrow, H. Michaels, D. Brzezinski, A. Eyth and D. Sonntag, US EPA; C. Allen and J. Beidler, CSC

Air quality modeling is sensitive to meteorology and emissions at the hour-grid-cell level. For this reason, as our knowledge of the temperature sensitivity of emissions from onroad vehicles has grown, OAQPS and OTAQ have worked together to develop ways of using grid cell hourly temperatures to model emissions using MOVES. OTAQ has recently updated its onroad mobile source emissions model with the release of MOVES2014. This presentation will compare onroad-vehicle emission inventories produced with MOVES2014 using day-specific hourly temperatures to those produced using monthly average hourly temperatures for selected counties and months. This work will help quantify the effect of improved temporal resolution of temperatures on MOVES2014 emissions. The results have implications for how MOVES2014 emissions are generated for air quality modeling.

9:15 "Updates to Vehicle Population and Activity Data in MOVES2014," M. Beardsley, D. Brzezinski, D. Sonntag, US EPA and A. Eilbert and D. Cox, ORISE

The Motor Vehicle Emission Simulator (MOVES) is the US EPA's official mobile source inventory model used in state and local air quality compliance analysis. Mobile emission inventories are dependent on three major factors: 1) emission rates for specific pollutants, 2) vehicle activity, including vehicle miles traveled (VMT) and other driving behavior, and 3) vehicle populations and other fleet characteristics. The latest version of the model, MOVES2014, incorporates updates to the default population and activity data, including new national default VMT, vehicle populations, age distributions, average speed distributions, driving cycles (second-by-second speed traces), and extended idling of long-haul trucks. There have also been important changes to physical fleet characteristics, such as to average mass, aerodynamic drag, and tire rolling resistance by vehicle source type. We will also discuss a number of updated tools for importing local data, including one that converts user-supplied daily VMT measurements to annual estimates and another that projects local age distributions in future years while retaining the losses in growth due to the 2008-2009 economic recession

9:40 BREAK

10:10 "An Analysis on 2011NEI Mobile Source Inventory Generated by MOVES and SMOKE-MOVES," J- S Lin, VADEQ; J. McDill, MARAMA; and E. Zalewsky, NYSDEC.

The MARAMA MOVES Workgroup has been reviewing 2011 NEI mobile emission inventory since version 1 was released by EPA on September 30, 2013. The Workgroup recommended several areas for improvement to EPA. In this presentation, we highlight key subject areas which have resulted in changes in 2011 NEI, including MOVES inputs, representative county approach, and extended idling methodology. MOVES inputs such as vehicle population (VPOP) and vehicle mile traveled (VMT) are compared on a continental scale between two NEI versions and between the base and future years in conjunction with census and land size data. Vehicle age, considered to be one of the most important MOVES inputs, is investigated in terms of vehicle type and model year along with its implementation in current representative county approach. Recent changes in extended idling from VPOP-based in version 1 to idling hour in version 2 are examined and compared with supporting truck stop and parking space data. The Workgroup continues to work on other subject areas (meteorology and SMOKE-MOVES emission rate tables) and will recommend additional changes to future NEI versions in an effort to improve mobile emission inventory for use in regional air quality modeling.

10:35 "Development of Onroad Emissions for the 2011 NEI," A. DenBlyker, J. Koupal, J. Alvis and S. Fincher, ERG; A. Zubrow, D. Brzezinski, H. Michaels, A. Eyth, and L. Driver, US EPA

The 2011 NEI is the first to rely solely on EPA's Motor Vehicle Emission Simulator (MOVES) to estimate on-road emissions for states outside of California, using the SMOKE-MOVES framework to produce the county-level emissions needed for the NEI. State/local/tribal air agencies were encouraged to submit local inputs for MOVES, resulting in vehicle fleet and activity data submissions for over 1,400 counties, the largest compilation of local MOVES data to date. To facilitate this, EPA developed a standardized framework for agencies to submit MOVES input data, taking advantage of MOVES features to streamline the input of local data. EPA and Eastern Research Group (ERG) then compiled, quality-assured and formatted the state-submitted data for use in SMOKE-MOVES, improved default inputs where states did not provide data, updated "representing counties" used by SMOKE-MOVES to define unique emission factors, ran MOVES in a cloud-computing environment to produce the needed emission factors, and ran SMOKE-MOVES to produce the final county-level NEI emissions. The Coordinating Research Council (CRC) also contributed to this effort by sponsoring two projects aimed at evaluating and improving the MOVES inputs. ERG first analyzed the county-level MOVES data submitted by the states, finding significant variability in the data vs. MOVES defaults and a large degree of sensitivity in total emissions predicted by MOVES as a result. ERG then identified national datasets that could be used to improve default on-road inputs at the local level, and updated these defaults for vehicle age distribution, vehicle population and long-haul truck VMT.

11:00 "Modeling Truck Idling Emissions in Central Texas," A. Hoekzema, Capital Area Council of Governments, Austin, TX.

The Capital Area Council of Governments (CAPCOG) represents 10 counties in Central Texas that include the counties that make up the Austin-Round Rock Metropolitan Statistical Area (MSA). CAPCOG has completed two research projects on truck idling in recent years order to estimate the extent of idling activity and the effectiveness of idling restrictions and technologies in reducing emissions. In 2011 and 2012, CAPCOG collected over 200 hours of field observational data on both extend and short-term idling within the region and conducted interviews with 118 truck drivers on idling activities and behavior. Analysis of the observational data, combined with extensive review of data collected from previous studies, enabled CAPCOG to develop updated idling profiles to model emissions from this activity within the region. Data collected from the driver interviews provided data on market penetration of various idle reduction devices and CARB-certified low-NO_X idle engines. The driver interviews also indicated that drivers typically idle at a lower engine speed than EPA's MOVES model assumes and provided data on levels of awareness and willingness to comply with idling restrictions, and willingness to use idle reduction infrastructure that can be used to model the control effectiveness of idling reduction control measures.

11:25 "Development of Road Traffic Emission Inventories for Urban Air Quality Modeling in Madrid (Spain)," R. Borge, C. Quassdorff, J. Lumbreras, J. Perez, J. Manuel de Andres, A. Narros, and E. Rodriguez, University of Madrid, Spain.

Madrid is one of the many urban agglomerations that are struggling to meet NO2 air quality standards in Europe. According to previous studies, road traffic is responsible for 57% of total NOX emissions in the Madrid metropolitan area and up to 90% of NO2 ambient concentration in the city center. Therefore it is utterly important to compile reliable emission inventories for this sector so specific measures and policies can be designed and assessed. This contribution discusses a field campaign made in Madrid to produce accurate input information as well as the models and methods used to compute emissions in a consistent way.

The vehicle fleet characterization study made use of already available resources of the Madrid Municipality (traffic cameras in 55 locations across the city). Information of nearly 5 million plates was captured and crossed with the database of the National Traffic Authority to map vehicles into the 199 categories considered by the COPERT 4 software (EMEP/EEA methodology). Traffic intensities and average speed were provided by the regional traffic-demand model used by the Madrid Municipality. Additional information (traffic signs, detailed vehicle trajectories, signal lights phases, etc.) was collected to feed a microscale traffic model (VISSIM) needed to generate instantaneous speed and acceleration data for a hot-spot (a heavily-trafficked roundabout). Emissions with resolution of seconds and meters were computed with ENVIVER (emission factors from VERSIT+) for this particular area. The results were aggregated and compared with those from the mesoscale model (COPERT) as a preliminary assessment for this approach.

11:50 LUNCH

Session 8: Oil and Gas

Chairs: Tom Moore, WRAP/WESTAR
Regi Oommen, ERG

8:00 "Design of a new Emissions Inventory Operator Survey for Oil and Gas Emissions of GHGs," A. Bar- Ilon, J. Grant, G. Heath, D. Zimmerle, L. Gribovicz, and V. Diakov, ENVIRON Corporation.

Substantial gaps between measurements of methane emissions from oil and gas systems and inventories meant to track those emissions have been well documented (Brandt et al. 2014). Many reasons could potentially explain the observed gaps and strategies taken to reduce them – discernment of the causes and reconciliation of measurement and inventory approaches is the chief goal of a new project sponsored by the US Department of Energy's National Energy Technology Laboratory and carried out by a large research consortium led by the Colorado School of Mines, the National Renewable Energy Laboratory and the National Oceanic and Atmospheric Administration. In this presentation, we will report on the development of a new emission inventory protocol that enhances and extends prior emission inventories of oil and gas air pollutant emitting sources. Key features of this enhanced protocol are a) the development of activity data contemporaneous to the period during which measurements are taken (same year and same day/week time period); b) the expansion of operator surveys to include episodic emission sources and not just routine (annualized) sources; and c) the inclusion of an expanded set of emitting sources in a basin, for instance gathering, processing and transmission systems in addition to the prior target sources of exploration and production. The new operator surveys (for episodic and routine sources) are being tested in the Denver-Julesburg Basin of northeastern Colorado during the fall and winter of 2014/2015. Early impressions of their effectiveness will be shared.

8:25 "Oil and Gas in the EPA GHG Inventory," M. Weitz, US EPA.

EPA has two complementary programs that characterize and improve our understanding of GHG emissions from the oil and gas sector. EPA's annual Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHG Inventory) includes national estimates of GHG emissions from the oil and gas sector. EPA's Greenhouse Gas Reporting Program (GHGRP) provides detailed, facility-level emissions data from the oil and gas sector. Consistent with the goals set out in the President's Methane Strategy, EPA is assessing new data (from the GHGRP and other sources) and is engaging with stakeholders and researchers to continue to enhance its methane emissions estimates. This presentation will focus on the development and improvement processes for the GHG Inventory.

8:50 "Comparing Top-Down and Bottom-up Estimates of Oil & Gas Methane Emissions: A Spatially-Resolved Emission Inventory for the Barnett Shale Region, Texas," D. Lyon and D. Zavala-Araiza, Environmental Defense Fund.

In October 2013, a coordinated research campaign was performed in the Barnett Shale region of Texas to quantify methane emissions from the oil & gas sector. Ten research teams made measurements of O&G sites and landfills at multiple scales, including direct measurements of individual components, near-field measurements of sites, top-down measurements of regional emissions, and measurements of stable isotope and hydrocarbon ratios for source apportionment. As part of the campaign synthesis, a spatially-resolved methane emission inventory for the Barnett Shale region was developed from multiple data sources including campaign measurements and a national study of gathering and processing facilities. Spatially-referenced activity data were compiled from federal and state databases. Monte Carlo simulations were used to calculate O&G facility emission factors from measured site emission rate distributions including high emission sites (super-emitters). A sensitivity analysis was performed to determine the effect of super-emitter frequency on regional emission estimates. The EI was compared to alternative O&G inventories based on data from the EPA Greenhouse Gas Inventory, GHG Reporting Program, and other sources. The spatially-resolved EI was compared to aircraft-based mass balance estimates of regional total and O&G emissions made during the campaign. The results were assessed to determine the potential causes of divergent top-down and bottom-up emission estimates reported in other regions.

9:15 "Top-Down Estimation of Emissions from Oil and Gas Production and their Impact on Air Quality within a Regional Air Quality Model," S. McKeen, R. Ahmadov, W. Angevine, K. Aikin, J. Brioude, C. Brock, S. Brown, Y. Cui, G. Frost, J.A. DeGouw, J. Gilman, B. Lerner, J.A. Neuman, J. Peischl, J.M. Roberts, T. Ryerson, M. Trainer, P. Veres, C. Warneke, and B. Yuan, CIRES/NOAA.

The surge in oil and gas production within the U.S. over the past decade is not adequately represented in existing emission inventories, hence their influence on regional O3 and atmospheric composition is not known. Detailed observations of VOC, CH4 and NOx within several oil/gas producing basins are available from recent NOAA sponsored aircraft (SENEX-2013) and ground-based field studies (UBWOS-2012,2013, SONNE-2012) that can be used for top-down emissions development or inventory verification. Observationally based CH4 flux estimates from oil/gas activity in the 2012-2013 time period are available for 5 regions: the Uintah and Denver-Julesburg basins in the Western U.S., and the Haynesville, Fayetteville and Marcellus shale basins in the Eastern U.S. Observed VOC and NOx correlations with CH4 are used to derive emission ratios relative to CH4 in each location. The oil/gas activity VOC and NOx profiles are quite different from basin to basin, and combined with the CH4 flux estimates allows for top-down based estimates in the 5 basins. These are compared with corresponding emissions within the U.S. EPA NEI-2011 (version 1) inventory. The top-down emission estimates are further applied within a fully coupled regional meteorology/air-quality model, WRF-Chem, with 12km grid resolution covering the continental US during the summer of 2013 SENEX field study period. Model differences in ozone precursors, several oxidants, PM2.5 mass and composition, are quantified through simulations that include or remove oil/gas sector emissions. The derived impacts of oil/gas emissions based on the top-down approach are also compared with the oil/gas impact from the NEI-2011 inventory.

9:40 BREAK

10:10 "Update on Action Plan to Improve Oil and Gas Emission Inventories," M. Gibbs, OK DEQ.

The National Oil & Gas Emissions Committee convened a summit at the EPA RTP offices in November 2014. Attendees included staff from multiple EPA offices as well as air quality regulators from states with significant prior experience in inventorying and regulating oil and gas emissions and also from states dealing with the rapid expansion of on-shore unconventional oil and gas extraction. The top topics identified beforehand to help guide discussions were how to: derive better activity and emissions data from industry; achieve a better understanding of data gaps; update outdated or inaccurate activity data and/or emission factors; and realistically represent "fat-tail" upstream sources.

The action plan developed at the summit includes: reviewing how emissions from on-road and non-road engines at production sites are currently characterized; evaluating crosswalks between data fields and emission factors in the National Oil & Gas Area Emissions Tool, the GHGRP and the National GHG Inventory; developing a repository of information on regulatory programs, reports and training materials to help states build capabilities; using GHGRP emissions calculations data that industry must report by March 2015 to improve estimates of emissions of criteria pollutants for the 2014 NEI; communicating and working more effectively with operators in order to better understand current work practices and to improve activity data; and compiling gas composition data to better characterize heterogeneity between and within basins.

An update on the progress on this action plan will be given and longer term goals for inventorying this important but complex sector will be discussed.

10:35 – 11:50 "Oil and Gas Panel Discussion – B. Bohlmann, State of WY; M. Gibbs, State of OK; M. Weitz, US EPA/OAP; J. Snyder, US EPA/OAQPS; D. Lyon, EDF; K. Ritter, API; and A. Zivkovich, Anadarko Petroleum

Following a series of podium paper presentations on the morning of April 16th, the O&G Emissions panel will convene to present and discuss a variety of perspectives on data collection, analysis, and applications of upstream and midstream O&G Emission's data. Panelists invited are a cross-section of emission inventory program leads and subject matter experts from state air agencies, U.S. EPA, environmental organizations, and O&G industry operators. Panelists are asked to address the following questions in brief remarks, supported by a brief presentation as needed, within about 8 minutes. Panelists are expected to identify the highest priority technical issues and activities their organization is working on, with respect to the questions.

- What are your group's most important, current challenges in estimating emissions and conducting related analyses for the upstream and midstream O&G emission sector?
- How can we improve emission estimates for the most uncertain parts of this sector in inventories?
- What is your organization doing to address gaps and data quality?
- Where do O&G emissions databases need to be, 2 years from now – in terms of integration, completeness, quality, representativeness, et cetera?
- What are needed changes to tracking and reporting O&G emissions for Clean Air Act planning requirements, and how does your organization want to see those changes accomplished?

11:50 LUNCH

Session 9: Tools/Emerging Technologies

Chairs: Sally Dombrowski, US EPA/OAQPS
Michael Burton, AZ DEQ

8:00 "AVERT –EPA's New Tool that Estimates the Emission Impacts of Energy Efficiency and Renewable Energy Using Statistically Driven Behavioral Simulation of Historical EGU Dispatch Patterns," R. DeYoung, US EPA and J. Fisher, Synapse Energy Economic.

Historically, states have been reticent to use energy efficiency (EE) and renewable energy (RE) as an emission reduction strategy for criteria and CO2 pollutants to meet EPA regulations. In the past, estimating the emission reductions due to EE/RE was prohibitively complex or expensive. EPA released a new tool in February of 2014 designed to allow states and other stakeholders to easily calculate the locational emissions impact of EE/RE programs. AVERT, the Avoided Emissions and Generation Tool, has undergone rigorous peer review and beta testing with a select number of states. AVERT is equipped to provide emissions impacts in a format that can be used in air quality modeling and Clean Air Act plans to meet the National Ambient Air Quality Standards (NAAQS).

AVERT is a statistically driven behavioral model using hourly datasets from U.S. EPA's Air Market Program Data, publicly available operational data reported by utilities. AVERT's statistical module performs statistical analysis to identify which generators are likely to reduce generation and emissions of CO2, SO2, and NOx due to EE/RE delivered to the electricity grid. AVERT couples the reported hourly generation and emissions information with temporal energy savings and hourly renewable energy generation profiles to determine the emission reductions from EGUs within one of AVERT's ten regions. AVERT's main module analyzes the regional, state, and county-level emission impacts of different EE/RE programs and present information about location-specific emission benefits in easy-to-interpret tables and maps.

8:25 "Local GHG Inventory Tools for Government Operations and Communities," A. Denny, US EPA and L. Pederson, ICF International.

The U.S. EPA State and Local Branch has provided guidance and technical support to states on their greenhouse gas (GHG) emission inventories since 1990. EPA has leveraged this expertise at the state-level to develop the Local GHG Inventory Tools, to facilitate development of GHG inventories at the local level in a cost effective and transparent manner. Understanding these emission levels for government operations and community activities provides a baseline for tracking emission trends, developing mitigation strategies and policies, and assessing progress towards meeting goals. One of the Excel-based tools helps users to develop a baseline GHG of municipal operations, according to the Local Government Operations Protocol (LGOP), version 1.1; the other helps users develop a baseline GHG inventory according to the Global Protocol for Community-Scale GHG Emissions (GPC), version 0.9.

The tools are flexible to meet each localities needs and can be conducted at varying levels of detail. For example, a high-level inventory can be conducted by entering data for the city as a whole. Alternatively, users can enter data at the department level, the facility level, the account level, or any combination of the above. The more specific the data provided, the more accurate the tools will be for estimating GHG emissions and more helpful for developing targeted emissions reduction measures. In this paper, we will provide an overview of the new Local GHG Inventory Tools and provide examples of how the outputs can inform mitigation actions at the local level.

8:50 "Implementation of a MODIS Aerosol Algorithm for Air Pollution Detection," A. E. C. Lara, M. Hahn, E. Gülch, and R. Jimenez, University of Applied Sciences Stuttgart, Germany.

Air pollution has several negative consequences to life. The Continuous Air Monitoring Stations (CAMS) can calculate the levels of this contamination, but their range is too small. An alternative for the detection of the pollution is the use of satellites. The Moderate Resolution Imaging Spectroradiometer (MODIS), instrument on board of the satellite Terra and Aqua from the NASA, allows the calculation of the Aerosol Optical Thickness (degree in which aerosols prevent the transmission of light). The official product has a pixel resolution of 10 km., not good enough for a deeper analysis. A Simplified high resolution MODIS Aerosol Retrieval Algorithm (SARA) is implemented to improve this resolution. The algorithm creates a new raster with a resolution of 500 m. The AERONET data is not used for the calculation, instead, some aerosol models from the software OPAC (Optical Properties of Aerosols and clouds) are used. The algorithm is tested on the region of Bogotá, Colombia. The results are compared to the PM10 observations (Particle matter less than 10 µm/m3) measured by the Bogotá Air Quality Network CAMS showing a correlation of 0.51. Several validations are discussed.

9:15 "SLEIS-The Next Generation," K. Jeffery and B. Smith, Windsor 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 U.S. EPA's Emissions Inventory System (EIS).

SLEIS was designed and developed by Windsor Solutions, Inc. for 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 was able to deliver a shareable emissions inventory data management system that is an extremely powerful, and yet cost-effective, solution for the partner organizations.

Since being completed in early 2011, SLEIS is now being used by eleven regulatory agencies across the country, including state, local, and tribal authorities. As SLEIS has matured, a number of possible new features have been identified for incorporation into future versions of the software. We will review how SLEIS is being used today and look at what's next for the product. We will also discuss some of the future enhancements that will ensure that SLEIS remains a vital and current tool for emissions inventory development.

9:40 BREAK

10:10 "Temporal Allocator Tool Development in EMF," C. Seppanen, S. McCusker and J. McDill, MARAMA and B. H. Baek, UNC- Institute for the Environment.

Temporal Allocation (TA) tool has been recently implemented in the Emission Modeling Framework (EMF) that helps emissions modelers to effectively manage and perform emissions modeling system. Over the years, EMF has been updated not only to manage emissions modeling platform, but also added a tool called CoST (**Co**ntrol **S**trategic **T**ool) for users to allow to develop future controlled inventories under various controls measures and control strategy plans. This new TA tool is a new addition to the EMF and will allow users to temporalize annual/monthly/daily emissions inventories using temporal profiles and cross-reference input files from the SMOKE modeling system and provide seasonal, monthly, weekend/weekday or daily emission inventories in a format suitable for inventory analysis. The purpose of this tool is to conveniently temporalize annual/monthly/daily inventory without using the SMOKE modeling system and allow users to effectively perform various analysis tasks, such as the effect High Electricity Demand Days (HEDD), short-term SIP inventories (weekday/weekend, ozone season), and so on. This GUI will allow users to browse and choose the sector-specific inventory and choose the temporal resolutions (seasonal, month, weekday/weekend, and average-day, periodic and so on).

10:35 "Excel-based Program for Project Level MOVES Modeling," A. Ali and M. LePage, RWDI.

'Project scale' is the finest level of modeling in MOVES. However, it requires a considerable amount of both time and resources to prepare the requisite runspec files, create the input databases, run the model, and post-process the results. This is especially challenging for applications outside of the U.S. where required information can be scarce. An automated excel-based program has been developed to perform pre- and post-processing steps involved in a project level MOVES run combining the USEPA conversion tools and other resources. The program serves as a one-stop solution for a project level MOVES run that can calculate emission rates for each hour of a day in a single session for projects involving roadways, transit facilities, and hoteling activities. The program can save as much as 80% of the workload required if relying solely on manual file preparation using the MOVES GUI.

The program prepares runspec files by pre-selecting common options specific to the project scale. It uses climate normal data, registration distribution, and VMT distribution to populate database tables, or it can draw the information from MOVES default database where available.

Generally, it uses average speed by link but uses MOVES default operating mode distributions adjusted for idling for intersection approach links. Options are also provided to adjust average speeds based on level of congestion. The second-by-second drive schedule and operating mode distribution options have yet to be implemented. For some applications users are required to tweak some tables manually to fit project-specific requirements.

11:00 "Demonstration of the New Improved Consolidated Point Sources Criteria, Toxics and GHG Annual Emissions Inventory System based on Device Level Reporting," A. Ghasemi, SCAQMD

Under SCAQMD's Annual Emission Reporting (AER) Program, there are approximately 2,000 facilities that are required to report their annual criteria, toxics, and Air Toxics "Hot Spots" (AB 2588) program quadrennial toxics emissions inventory. The reported data provides the basis for the point source emissions inventory for the development of SIPs, control strategies, rules and regulations, public policy, and emission fees. SCAQMD has offered electronic reporting tools to facilities since 1996. Recently, a new improved consolidated AER web reporting tool has been developed by SCAQMD and Ecotek based on a more detailed reporting approach.

The new consolidated AER reporting tool is based on device level reporting and built around the SCAQMD's facilities permit profile structure to enhance data quality, data sharing and accessibility to SCAQMD's engineering, compliance, and planning divisions. The AER reporting tool's user friendly interface, for both reporting facilities and SCAQMD staff, contains easy-to-use screens to define, categorize, and report emission sources, calculation "wizards", built-in defaults for selected sources, reports, data validation, fees calculation, automatic assignment of SCCs, and "Import Last Year" data feature. Additionally, the new AER reporting tool has a separate module for SCAQMD staff to process, audit, generate reports, and export data to the California Air Resource Board's CEIDARS database which is ultimately submitted to EPA. Moreover, to reduce the burden of the new detailed reporting on a device level, a group reporting feature has been developed for combustion sources. This demonstration will illustrate the use of the new consolidated AER.

11:25 "Emissions, What Emissions, Examples of Emission Inventory Use by the Air Quality Program of the Confederated Tribes of the Colville Reservation," K. Ray, Confederated Tribes of the Coleville Reservation.

The importance of emission inventory (EI) data for air quality programs, natural resource and land use planning may not always be recognized. This presentation provides examples of six years of EI data that support the air quality program, identify issues and areas of concern. The delineation of four airsheds helped gain a better understanding of the distribution of point and area source impacts. Airsheds also vary by economics, populations, natural resource and wildfire impacts. These factors helped justify the placement of three permanent continuous PM2.5 monitors that provide health guidance for the population. Identifying trends and impacts of existing facilities, area sources and potential sources are useful for management decisions, permitting and where resources should be focused. Wildfire smoke can vary greatly by year, airshed and area, and have been identified as the largest source of emissions on the Reservation. Wildfire smoke impacts large areas and thus more of the population than other sources combined. The EI data highlights the significance of smoke and focuses the program to develop outreach opportunities to help minimize the effects. Graphing emissions by season provides a very useful tool to identify when outreach efforts should be increased and what to focus on. Actions resulting from EI data analysis include outreach material development, smoke management coordination workshop, review of natural resource projects and land use permits and identification of priority areas. EI information and consequent uses of it are all aimed at protecting the health of the Tribal membership and residents of the Colville Reservation.

11:50 LUNCH

Session 7: Mobile Sources (continues) **Chairs: Gary Dolce, US EPA/OTAQ**
Alexis Zubrow, US EPA/OAQPS
John Koupal, ERG

1:20 "Vehicle Emissions and Life Cycle Analysis Models of Gasoline and Electric Vehicles," C. Walker and A. M. Tawfik CA State University, Fresno.

In addition to air pollution emissions, the transportation sector in the US is responsible for more than 25% of greenhouse gas emissions. Due to the negative impacts of these emissions, primarily on health and the environment, literature of vehicle emissions models is rich. Yet, attempts to synthesize and contrast models of this rich literature are scarce. Contrasting models of gasoline and electric vehicle emissions could be particularly beneficial due to the significant differences between these two technologies; specifically with respect to emissions. Accordingly, this paper adopts a life cycle analysis approach to synthesize and explore the development and structure of some of the most common emissions models. The paper starts with a brief discussion of the emission models measurement techniques; then, explores and contrasts state-of-the-art vehicle emissions models. Four groups of emissions models are included in this synthesis: 1) Macro-scale models: MOVES2014 and EMFAC; 2) Meso-scale models: VT-Meso, MOVES2014, and MEASURE; 3) Micro-scale models: VT-Micro and CMEM; and 4) Electric lifecycle models: GREET. The paper highlights the effects of lifecycle analyses of both gasoline and electric vehicles on estimates of vehicle greenhouse gas emissions from each of these two technologies. The paper ends with a discussion of the shortcomings of current vehicle emissions models, limitations of their usage and application, and suggestions for future work.

1:45 "Long-Term Trends in Mobile Source Emissions and Urban Air Quality," B. McDonald, S-W Kim, G. Frost and M. Trainer, CIRES, Colorado

Mobile sources are a major urban source of carbon dioxide (CO2) and co-emitted carbon monoxide (CO), volatile organic compounds (VOCs), nitrogen oxides (NOx), and particulate black carbon (BC). Emissions from on-road gasoline engines have been reduced by over an order of magnitude between 1970 and 2010, including for CO and VOCs, largely from widespread deployment of three-way catalytic converters. Emissions from on-road diesel engines have decreased much more slowly due to large growth in freight activity and slower decreases in exhaust emission factors for NOx and BC. In this study, we use a fuel-based approach to map mobile source emissions from on-road and off-road engines spatially and temporally. We present multi-decadal air quality modelling results for Los Angeles, as an example of how U.S. urban air quality has trended. We attribute much of the factor of 4 to 10 decreases observed between 1970 and 2010 in ambient CO, VOC, NOx, and BC concentrations to decreases in mobile source emissions. Lastly, we identify challenges for estimating future mobile source emissions, as well as demonstrate the utility of using a fuel-based approach in mapping emissions of CO2 and co-emitted air pollutants simultaneously.

2:10 "Emission Projections for Long-Haul Freight Trucks and Railways through 2050 in the United States", L. Liu, T. Hwang, and S. Lee, University of Illinois—Urbana/Champaign, S. J. Smith, PNNL, Y. Ouyang, B. Lee, K. Daenzerand,, University of Illinois-Urbana/Champaign, F. Yan, University of Illinois-Urbana/Champaign/Argonne National Labs, and T. C. Bond, University of Illinois-Urbana/Champaign.

This work develops an integrated model approach to project emissions from long-haul freight truck and rail transport in the U.S. between 2010 and 2050. We connect models of economic activity, freight demand, and emission technology to represent the different factors affecting freight emissions and its spatial distribution. Future uncertainties are represented by four macroeconomic scenarios with different economic growth rates and climate policy. Our estimates show that while freight activities are more than doubled or tripled in the four scenarios by 2050, freight fuel use increases at a slower rate because of improved fuel efficiency; freight emissions of all pollutants decrease significantly by 2030 due to the retirement of older vehicles built under less stringent emission standards. Climate policy causes a modal shift from truck to rail because of higher fuel prices, resulting in a 30% reduction in fuel use and similar reductions in particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NOx), and total hydrocarbon (THC) emissions. Alternative mitigation policy to expand highway capacity eases congestion, improves fuel efficiency, and reduces emissions. The elimination of superemitters stands out as achieving the most emission reduction for PM, CO and THC, reducing 65%, 30%, and 25%, respectively.

2:35 "Category 1/Category 2 Vessel Port Underway Split for 2011 National Emission Inventory," R. Billings, H. Perez, J. Sellers, and R. Chang, ERG and L. Driver, US EPA.

This paper presents how EPA spatially apportioned emission estimates for Category 1/Category 2 vessels based on data from a 2006/2007 EPA Category 1/ Category 2 vessel census.

The US EPA is responsible for developing emission inventories to be included in to the National Emission Inventory (NEI) every three years. Two EPA offices work closely to develop emission estimates and ensure consistency for the marine vessel component of the NEI: the Office of Transportation and Air Quality (OTAQ) develops emission estimates in support a regulatory initiatives and the Office of Air Quality and Planning and Standards (OAQPS) speciates the HAPs, spatially allocates emissions and compiles the emissions into the Emission Inventory System (EIS) format for inclusion into the NEI.

Historically, the focus of the marine vessel emission inventories has been on the larger vessels equipped with Category 3 engines. Emissions for the smaller Category 1 and 2 powered followed older State Implementation Plan (SIP) inventory guidance regarding how emissions are spatially allocated—specifically, 75% in port and 25% underway. This allocation has yielded elevated and unrealistic emissions/risk modeling levels near ports that have a significant amount of tug, towboat, and smaller freight vessel traffic.

In 2006-2007, OTAQ commissioned a census of vessels equipped with Category 1 and 2 engines that included an assessment of size of the fleet, power ratings, typical hours of operation, and general areas of activity. The 2007 census compiled data from a wide variety of appropriate sources specific to vessel types associated with these smaller marine engines. This 2007 census provided a dataset of activity of kilowatt hours by vessels type and linked the data to port and waterway Geographic Information System (GIS) shapefiles. The census dataset was used to spatially allocate 2011 emission estimates developed by OTAQ for Category 1 and 2 powered vessels. Results from this approach provided a port/underway split for these vessels of approximately 5% / 95% respectively, which is significantly different than the SIP approach.

The paper will discuss how the vessel census data were developed and used in the 2011 NEI, it will also note anomalies in the census data (e.g., ferries, tugs, offshore oil and gas support vessels) and corrections made. Future applications of this approach to be used in the 2014 NEI are also discussed, along with activities that can be implemented to validate the census data and emission estimates.

3:00 BREAK

3:30 "Modeling Non-Road Agricultural Tractor Emissions in Central Texas," A. Hoekzema, Capital Area Council of Governments, Austin, TX and R. Baker, ERG.

The Capital Area Council of Governments (CAPCOG) represents 10 counties in Central Texas that include the counties that make up the Austin-Round Rock Metropolitan Statistical Area (MSA). Existing estimates for non-road agricultural tractors indicate that it is the largest regional source of NO_X emissions among all NONROAD model equipment types. CAPCOG has developed an approach for modeling emissions of agricultural tractors that involves a very high degree of spatial and temporal resolution and provides significant improvements over existing methods. CAPCOG used county-level tractor population, horsepower distribution, and age distribution data from the Census of Agriculture in conjunction with regional survey conducted in 2012 by Eastern Research Group (ERG) on activity levels, engine type and horsepower, and age distributions to produce updated emissions estimates for key analysis years. CAPCOG's and ERG's research revealed that tractor activity and equipment profiles for Central Texas are significantly different from both statewide and nation-wide typical profiles, that usage varies significantly with horsepower rating, and that the standard scrappage assumptions in the NONROAD model does not appear to reflect actual in-use scrappage patterns for this equipment type. CAPCOG used USDA CROPSCAPE data to allocate county -level emissions to 4 km photochemical modeling grid cells based on the distribution of land used for agricultural production within each county. This research demonstrates the need for states, local governments, and tribes to develop regionally representative equipment and activity profiles when modeling emissions from this source category.

3:55 – 5:10 NONROAD PANEL DISCUSSION - A 75-minute session to get user input for EPA's planned update to improve nonroad modeling capabilities in MOVES. The session will include an EPA presentation describing current plans to update the model, and discussion with participants about potential improvements and priorities.

Session 8: Oil and Gas (continues) **Chairs: Tom Moore, WRAP/WESTAR**
Regi Oommen, ERG

1:20 "The Statistics of Super-Emitters: Modeling Heavy-Tailed Distributions of Environmental Pollutants with Power Laws," M. Mansfield, Utah State University.

Many observational datasets of environmental pollutants have highly skewed, non-Gaussian, heavy-tailed distributions, dominated by a relatively small number of "hot spots" or "super---emitters." Such datasets are problematic because it is difficult to adequately sample contributions from the high end of the distribution, and there are growing concerns that bottom-up estimates of methane emissions from the natural gas industry are too low. Obviously, standard statistical analyses based on Gaussian distributions cannot be applied. I show that a number of datasets of methane emissions from oil and gas fields are well represented by power laws, i.e., probability distribution functions proportional to 1/xz, for z a constant positive exponent. The power law provides a characterization of the spectrum of super-emitters. I demonstrate statistical tools that can be applied under the assumption of random sampling, and that provide 95%-confidence constraints on the result of a set of measurements. Unfortunately, unless datasets are quite large, it is the nature of such distributions that the constraints are usually quite broad.

1:45 "EPA's Oil and Gas Emissions Estimation Tool," M. Pring and R. Oommen, ERG and J. Snyder, US EPA, and R. Huntley, US EPA (Retired)

Nonpoint source emissions from the oil and gas exploration and production sector has gained interest in recent years in the United States as drilling technology has allowed development of unconventional oil and gas plays (such as shale or tight sands) in areas where there was previously no activity, or where activity had subsided after depletion of the conventional reserves. For example, the areas in and around the Barnett, Haynesville, and Eagle Ford Shales in Texas; the Marcellus Shale in Ohio, Pennsylvania, and West Virginia; and the Bakken Shale/Williston Basin in North Dakota and Montana have all experienced a rapid expansion in activity over the last ten years.

While the major emissions sources associated with oil and gas collection, processing, and distribution have traditionally been included in the National Emissions Inventory (NEI) as point sources (e.g. gas processing plants, pipeline compressor stations, and refineries), the activities occurring "upstream" of these types of facilities have not been as well characterized. In this paper, upstream activities refer to emission units and processes associated with the exploration and drilling of oil and gas wells, and the equipment used at the wellpad to then extract the product from the well and deliver it "downstream" to a central collection point or processing facility. The types of unit processes found at upstream sites include separators, dehydrators, storage tanks, and compressor engines.

The NEI nonpoint oil and gas emissions inventory is primarily developed using data supplied to EPA by state air agencies. Where state data is not supplied to EPA, EPA attempts to populate the NEI with the best available data. In the case of nonpoint oil and gas emissions estimates, EPA developed the Nonpoint Oil and Gas Emission Estimation Tool (the "Tool") described in this paper to estimate emissions from this category.

2:10 "An Analysis of the US EPA Oil and Gas ACCESS Database Tool," J. McDill, MARAMA and Jin- Sheng Lin, VADEQ.

US EPA has developed an ACCESS database tool designed to estimate criteria and toxic air pollutant emissions from Oil and Gas exploration, development and production. The tool was used to estimate emissions for the 2011 National Emissions Inventory (NEI) and the National Air Toxics Assessment (NATA). The tool estimates emissions for 51 pollutants from 101 US Oil and Gas Basins. For each basin it employs 994 emission factors and 423 activity parameters. While the tool represents an excellent first step toward estimating Oil and Gas emissions, there is a need to analyze the results to understand what drives emissions of important pollutants. For example, the listed source of many of the emission factors are unknown (226 factors) or AP-42 Chapters 3 & 13 (357 factors) or Placeholders (104 factors).

This work analyzes the 2011 oil and gas inventory to identify and evaluate the key factors that result in the most significant amount of emissions by pollutant. The source of key emission factors is identified and evaluated.

2:35 Wrap Up and Next Steps – Regi Oommen

3:00 BREAK

Session 10: Speciated Emissions Data and Their Use

Chairs: Mike Kosusko, US EPA/ORD
Rich Mason, US EPA/OAQPS

1:20 "EPA's SPECIATE 4.4 Database: Bridging Data Sources and Data Users," M. Kosusko, A. Zubrow, R. Cook, SPECIATE Workgroup, US EPA and Y. Hsu, J. Dorn and F. Divita, Abt Associates.

SPECIATE is the U.S. Environmental Protection Agency's repository of profile data for chemical species of air pollutants emitted by specific source categories. EPA released SPECIATE Version 4.4 in February 2014. This ACCESS database includes 5,728 Particulate Matter (PM), Volatile Organic Compound, Total Organic Gases, and Other Gases profiles. 2,346 chemical species are included. Data come from many sources, including peer-reviewed journal articles and emissions testing. SPECIATE provides an important intersection of emission profile data development and its use. Some uses of source profiles include: (1) creating speciated emissions inventories for regional haze, PM, greenhouse gas, and photochemical air quality modeling; (2) estimating hazardous and toxic air pollutant emissions from PM and organic gas emissions; (3) providing input to chemical mass balance receptor models; and (4) providing a repository of compounds searchable by source category and pollutant. For example, SPECIATE 4.4 added profiles to support two important OTAQ objectives – Tier III rulemaking and the release of the MOVES 2013 model – by making associated profiles more accessible and increasing the transparency of the rulemaking process. SPECIATE emission profiles also underpin the newest data set used by OAQPS to run its emission inventory and other models (the 2011 NEI modeling platform). In particular, SPECIATE is being used to better characterize Pulp & Paper emissions. This paper describes the SPECIATE 4.4 database, provides specific examples of sources of data and the use of SPECIATE emission profiles in emissions inventories, and makes recommendations for future improvements in the SPECIATE database.

1:45 "Characteristics and More Accurate Emission Factors of Vehicular Evaporative Emissions," H. Y. Man and H. Liu, Tsinghua University, China.

Evaporative emission from gasoline-powered vehicles is a significant source of VOCs in urban atmosphere. The existing evaporative emission inventories of China are unreliable as studies of local emission factors are poor. In this study, four types of evaporative tests were conducted with four Chinese and two American vehicles based on EPA standards as well as Chinese Type IV test. Emission factors of four emission types (i.e. diurnal, hot soak, refueling, permeation) were measured. For Chinese vehicles, the results were 0.95g/L for ORVR refueling emission, 0.93g/test, 6.53g/day and 9.53g/day for 24-hour, 48-hour and 72-hour diurnal emission respectively. For American vehicles, these values were 0.01 g/L, 0.32g/test, 0.37g/day and 0.34 g/day. The emission factor of hot soak was 0.064±0.008g/hour for both vehicle types.

The emission factor of 72-96-72 Fahrenheit build permeation was close to diurnal emission before the canister saturated. Assuming that the limitation of Tier-2 is implemented in China, the efficiency of the canister would be more than 99% for refueling test and 98% for diurnal emission. These data will be valuable for setting up control strategies. Moreover, during every test step, the gas in shed was sampled and analyzed by gas chromatography–mass spectrometry with flame ionization detection (GCMS/FID). The mass measured by GC-MS was about 32% higher than that by FID. This implies that the FID method tends to underestimate emission factors, and consequently the inventory, since it uses mean relative molecular mass in calculation. More accurate emission factors calculated by GC-MS/FID will be given after further analysis.

2:10 "Contributions of Tire Wear and Brake Wear to PM Emissions Inventories for On-Road Mobile Sources," S. Bai, Y. Du, and S. Reid, Sonoma Technology.

On-road mobile source emissions are a major contributor to PM10 and PM2.5 emissions inventories in urban areas. Motor vehicles emit PM through combustion exhaust, tire wear, brake wear, and the resuspension of roadway dust. Historically, exhaust emissions have dominated mobile source inventories, especially for PM2.5. However, federal emissions standards have dramatically reduced exhaust emissions over time, while other forms of PM emissions have remained largely unregulated. In addition, non-exhaust PM emission rates in current mobile source emissions models (e.g., MOVES and EMFAC) have not been as extensively researched and refined as exhaust emission rates and remain highly uncertain.

These issues are of growing concern to the transportation planning community, which must consider tire wear and brake wear emissions, as well as exhaust emissions, in project-level analyses conducted for transportation conformity purposes. Conformity requirements ensure that federally funded or approved transportation projects conform to the air quality goals of a State Implementation Plan (SIP). For some types of projects, the conformity process requires PM Hot-Spot Analyses that feature emissions estimates for selected years in the life of the project.
This paper presents results of case study analyses that demonstrate how PM exhaust emissions generally decrease sharply over time as vehicle fleets turn over, while tire wear and brake wear emissions remain constant or even

increase with growing traffic activity. Implications for transportation planning are discussed, along with uncertainties associated with tire wear and brake wear emissions estimates.

2:35 "Incorporation of Air Toxics and Improved Speciation for Non-road Emissions in MOVES," L. Reichle, ORISE Fellow, US EPA; R. Cook, D. Sonntag, H. Michaels, D. Brzezinski, E. Glover, M. Beardsley, A. Zubrow, A. Eyth and L. Driver, US EPA.

We are adding the ability in MOVES to produce emissions of air toxics from non-road equipment, similar to the current capabilities within MOVES for on-road vehicles. The air toxics include gaseous air toxics (e.g., benzene, ethanol, 1, 3-butadiene, formaldehyde, acetaldehyde, acrolein), polycyclic aromatic hydrocarbons (e.g. naphthalene), metals (e.g. mercury, chromium IV) and dioxins/furans.

In addition, we are developing new Total Organic Gas (TOG) speciation profiles specific to non-road exhaust emissions. To support the additional toxic data and speciation profiles, we analyzed data collected from non-road emission test programs conducted under contract by the US EPA. The data include speciated exhaust emissions from 2-stroke and 4-stroke non-road gasoline engines (using 0% and 10% ethanol-gasoline blends), as well as pre-Tier 1, Tier 1 and Tier 2 non-road diesel engines.

MOVES will provide estimates of air toxics emissions from non-road equipment to SMOKE for processing for air quality modeling. The calculation of chemical mechanism species (e.g. CB06, CB6) will continue to be calculated in SMOKE. However, we are updating the source classification codes (SCC) output by MOVES for non-road sources to so that SMOKE can match emissions with the appropriate speciation profile. These changes will have important impacts on the inventory of air toxics and emission inventories used for air quality modeling.

3:00 BREAK

3:30 "Effects of Temperature on Gasoline Motor Vehicle Exhaust VOC Speciation," A. Roy and Y. Choi, University of Houston; D. Sonntag, C. Yanca, R Cook, D. Hawkins, C. Schenk and J. McDonald, US EPA

This study estimates the effects of temperature on the speciation of exhaust VOC emissions from modern technology gasoline vehicles. This study focuses on the speciation of VOC emissions from gasoline vehicles from model year 2006-2010. Overall, ten vehicles were tested. All vehicles but one subscribed to the Tier 2 Bin 5 standard. Two combustion technologies were evaluated, namely Multi-Point Fuel Injection and Gasoline direct injection. The driving cycles considered were the urban Federal Testing Procedure (FTP) and the highway US-06. The cycles were evaluated at three temperatures- 0, 20 and 75oF. Both Cold Start and composite emissions were evaluated for the FTP cycle. A Monte Carlo technique was utilized to calculate fleet average emissions for each driving cycle. Additionally, the effect of varying technology (MPFI vs. GDI), and varying fuel composition (E10 vs. E15) were assessed. The results indicate that temperature can have a significant effect on VOC speciation, and that the speciation of emissions from GDI vehicles could be significantly different from their MPFI counterparts.

3:55 "National Emissions from Lawn and Garden Equipment," Jamie Banks, Quiet Communities, Inc., and R. McConnell, US EPA.

Background: The contribution of gasoline-powered lawn and garden equipment (GLGE) to air pollutant emissions in the United States has not been extensively studied.

Goal: Our goal is to provide annual US and state-level emissions estimates of volatile organic compounds (VOC): criteria pollutants (carbon monoxide [CO], nitrogen oxides [NOx], particulate matter [PM] <10 microns, including PM < 2.5 microns [PM 10, PM2.5]; and carbon dioxide (CO2) from GLGE, with a focus on 2-stroke engines. Methods: Pollutant data were extracted from tier reports from the 2011 National Emissions Inventory for GLGE (Source Code Classifications 2260004021−2265004071), and the Environmental Protection Agency's 2011 modeling platform (version 6) and nonroad model. Data were sorted by equipment type and characteristics. Aggregate and equipment specific emissions were calculated and compared with emissions from all gasoline-fueled nonroad equipment. Results are presented as descriptive statistics.

Results: In 2011, approximately 26.7 million tons of pollutants were emitted by GLGE (VOC=461,800; CO=5,793,200; NOx=68,500, PM10=20,700; CO2=20,382,409), accounting for 24%−45% of all nonroad gasoline emissions. Two-stroke engines accounted for 35% of VOC and NOx, 10% of CO, and 83% of PM10 and PM2.5 from GLGE. The vast majority (86%−95%) of each pollutant came from 2-stroke chain saws, leaf blowers/vacuums, and trimmers, edger's, and brush cutters. State data (California, New York, Texas, Illinois, and Florida), 2018 projections, and additional comparisons will be presented. Methodological issues will be discussed.

Conclusions: GLGE accounts for a major portion of US nonroad gasoline emissions. Two-stroke engines are an important source of VOCs and criteria pollutants.

4:20 "Development of Chemically Resolved Profiles for Attainment Planning," L. Ramirez and W. Yang, ARB.

For areas in non-attainment of the ambient air quality standards, attainment plans provide the blueprint for areas to show prospective compliance of the standards. These plans need to be based on sound science. One of the key components for both the determination of attainment status and projecting compliance of the standards is the emissions inventory for the planning region. The inventories for ozone precursors and PM2.5 need to be chemically-resolved to help characterize the non-attainment problem in the region, and provide the necessary data for air quality modeling and air quality analyses to support the attainment plan. For example, volatile organic compounds (VOCs) represent a broad class of compounds that need to be chemically resolved for air quality modeling inventories.
The California Air Resources Board (ARB) has a rigorous program in place to facilitate the development of speciation and size profiles for use in inventory development. This program includes rigorous testing of emission sources and fuels, and quality assurance activities to ensure data and profile integrity. In many instances the profiles need to be year-specific to capture the implementation schedule for regulatory drivers. For example, reflecting the ARB's truck and bus regulation in current and future years required development of calendar-year specific inventories for those categories.

4:45 "Evaluating Complexity in Fire Emissions Modeling-Is More Better?" K. Barsanti, Portland State University; J. Orlando, L. Emmons and C. Wiedinmyer, NCAR; L. Hatch, Portland State University; C. Stockwell and R. Yokelson, University of Montana; P. Veres, CIRES/Colorado.

Hundreds of Tg of gaseous non-methane organic compounds (NMOCs) are emitted globally to the atmosphere from biomass burning (BB), including wildfires, agriculture burning, and prescribed fires. Estimates of NMOC emissions—including identities and quantities—from these sources are highly uncertain, posing challenges to quantifying the effects of BB on air quality and climate. Concerted field (e.g., the Biomass Burn Observation Project) and laboratory (e.g., the Fourth Fire Lab at Missoula Experiment, FLAME-IV) studies, and application of advanced instrumentation (e.g., proton-transfer-reaction time-of-flight mass spectrometry and two dimensional gas chromatography), have led to the identification and quantification of hundreds of NMOCs in BB emissions. Although appropriate representation of these NMOCs in models is critical for accurate prediction of downwind air quality (e.g., ozone (O3) and secondary organic aerosol (SOA) formation), the explicit simulation of hundreds of NMOCs is not possible in chemical transport models. In this work, NMOCs identified during FLAME-IV were lumped into speciation profiles. Levels of gaseous air pollutants (e.g., nitrogen oxides (NOx), peroxyactyl nitrates (PAN), O3, and

SOA precursors) were predicted using a box model with the MOZART-4 chemical mechanism, supplemented with explicit representation of selected compounds. Sensitivity of modeled pollutants/precursors to the assumptions made in developing the speciation profiles was evaluated, which ultimately will influence the accuracy of predictions. Future efforts will include sensitivity analysis and validation using regional and global chemical transport models; such efforts will help determine the level of detail required in BB emissions inventories to achieve the desired level of accuracy in predictive models.

Session 11: Emissions Data QA and Data Analysis

Chairs: Zac Adelman, UNC
BH Baek, UNC

3:30 "Constraining NOx Emissions with Space-Based Data: Step 1: Understanding the Correspondence of Ozone Monitoring Instrument (OMI) NO2 Column Observations to US AQS and CEMS Data," B. Duncan, L. N. Lamsal, and Y. Yashida, NASA

The advantage of using satellite data, as compared to surface air quality networks, to estimate pollutant emissions is spatial coverage, particularly in most regions of the world where surface networks are sparse or nonexistent. For estimating NOx emissions, nitrogen dioxide (NO2) tropospheric column data from the Aura Ozone Monitoring Instrument (OMI) have proven useful. Since the launch of the Aura satellite over a decade ago, the NO2 retrieval algorithm has matured substantially so that the data are now of sufficient quality for quantifying NOx emissions and trends. (These algorithms convert electromagnetic radiation detected by OMI to the number of molecules of NO2 between the satellite and the Earth's surface.) In this presentation, we will discuss our efforts to further tailor the OMI NO2 retrieval algorithm for air quality applications, such as estimating NOx emissions, and show that the variations and trends in OMI NO2 data in polluted regions compare favorably to variations and trends in 1) EPA Air Quality System (AQS) concentration data and 2) reported emissions from the Continuous Emissions Monitoring System (CEMS) above power plants. Our work is part of the effort of the NASA Air Quality Applied Sciences Team (AQAST) to facilitate the use of satellite data by the air quality community.

3:55 "Evaluating Northeast Electric Generating Unit NOx Emissions Based on Electric Demand," D. MacKintosh and R. McConnell, US EPA.

Ground-level ozone in the Northeast has long been associated with warm sunny days when high electricity demand increases nitrogen oxide (NOx) emissions from electric generating units (EGUs) and sunlight promotes ozone formation. Each EGU typically has a temporal NOx emission limit (i.e. pounds per hour and/or tons per year) and a heat input NOx limit (i.e. pounds per million BTU). However, the total daily NOx emissions from all EGUs is highly dependent on electric demand and the resultant combination of which units operate, the fuel utilization at these units, and the emission control performance on the given day. This study combines Northeast EGU NOx emissions data from the EPA Clean Air Markets Division (CAMD) data base and electric demand reported by the regional electric grids (ISO New England, ISO New York, and PJM Interconnection) to analyze EGU performance on a NOx emissions per megawatt basis. Annual and regional comparisons are made to evaluate trends by emission rates, fuel utilization and effectiveness of controls. The study also addresses NOx EGU emissions not captured in the EPA CAMD data base and advises where inventories could be improved to better understand Northeast ozone formation.

4:20 "Evaluating CMAQ Simulations of Ammonia Sources, Formation and Impacts using Surface, Aircraft, and Satellite Data," C. Lonsdale, J. Hegarty, K. Cady-Pereira, M. Alvarado, Atmospheric and Environmental Research, D. Henze, M. Turner, University of Colorado-Boulder, J. Murphy, M. Markovic, T. VandenBoer, University of Toronto, and J. Nowak, Aerodyne Research.

Ammonia (NH3) can serve as an aerosol precursor and thus can impact air quality and the radiative budget of the Earth. Uncertainty in NH3 emissions lead to uncertainty in the formation, vertical distribution, and radiative impacts of ammonium nitrate and ammonium sulfate aerosol, which in turn leads to significant uncertainties in predictions of air quality and future climate. Here we present preliminary results of evaluating NH3 sources, formation, and impacts during both the 2010 NOAA CalNex and 2013 NOAA Southeast Nexus (SENEX) field campaigns (in LA and the Central Valley of California and the Southeast US, respectively). We use the Community Multi-scale Air Quality Model (CMAQ) driven with meteorological fields from the Weather Research and Forecasting (WRF) model to simulate NH3. Model results are compared to surface and aircraft measurements of aerosol inorganics and gas-phase NH3, HNO3, NOx, and SO2 during each campaign, as well as satellite NH3 observations from the NASA Tropospheric Emission Spectrometer (TES) and the NOAA Cross-track Infrared Sounder (CrIS) for each region.

4:45 "MOVES ODBC Transportation Inventory System", D. Wells, Colorado Dept. of Public Health and Environment.

The EPA MOVES (Motor Vehicle Emissions Simulator) model, which uses the MYSQL database system for input and output, is difficult to work with requiring the use of software quarry language. This difficulty can be overcome with the MOVES's installed Open Database Connectivity (OBDC) driver that can be used to link the data to other database systems like Microsoft Access. Such database systems employ graphical user interfaces that are easier to work with and provide built in mathematical functions. One such Microsoft Access relational database model was developed, using OBDC, to connect with the EPA MOVES2014 emission rates in MYSQL. This new model, named the "ODBC Transportation Inventory System" (OTIS), in general is run using the linked based Vehicle Miles Traveled (VMT) outputs from Traffic Demand Models (TDM) by the Denver Regional Council of Governments and the Northern Front Range Council of Governments. The NOx and VOC emission factors from MOVES are calculated on an hourly basis for six vehicle types and multiplied hour by hour and link by link with the VMT data from the TDMs. Specifically, the OTIS model has been used for several years for transportation conformity analyses, and was used to develop the Colorado Ozone Nonattainment Inventory. In addition, gridded VMT output by vehicle type from OTIS is being developed for use by SMOKE-MOVES as input for ozone modeling. Through these uses the OTIS model was found to be flexible, transparent, and more easy to use than hard-coded systems.