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**International Emission Inventory Conference**

**WELCOME**

Welcome to the 2019 International Emissions Inventory Conference!

The US Environmental Protection Agency (US EPA) looks forward to your participation in the 2019 International Emissions Inventory Conference in Dallas, Texas July 29 – August 2, 2019. This year’s conference theme is **Collaborative Partnerships to Advance Science and Policy** and as such, we aimed to bring you training courses, keynote speakers, presentations, and posters that highlight the work being done by the many great state, federal, and local agencies, research centers, and countries that collaborate to bring the latest information to the emission inventory community.

The conference consists of several different features with some new additions that we are excited to bring to this year’s program.

* **Training courses** – Monday, July 29, 2019 we will offer six courses on different aspects of inventory development and use taught by a wide range of emissions inventory and modeling developers.
* **Plenary Session** – Beginning Tuesday July 20, 2019, the general conference will open in the morning with a plenary for all conference attendees. The plenary will include a welcome by the US EPA followed by three exciting keynote speeches and capped off with a general Q&A session with the audience.
* **Lightning Sessions** – Tuesday afternoon will introduce a new type of session to the Emissions Inventory Conference. There will be two unique, consecutive lightning sessions in the plenary room that will be comprised of 5-minute talks covering a broad range of topics related to emissions inventories. These short talks will be a great way to inform the community of new and exciting projects that can bring about new collaborations.
* **Technical Sessions** – A full set of technical sessions covering 10 topics will begin Wednesday morning through Friday morning and will be comprised of topic-specific presentations from conference attendees.
* **Fireside Chat** – Thursday afternoon will bring the conference back to a plenary-style room for a “Fireside Chat” with representatives from different organizations to discuss the future of emission inventories. There will be opportunities during the week to submit questions for this chat and help steer this more casual conversation.
* **Poster Session** – Tuesday afternoon will include a designated poster session filled with interesting topics displayed on posters. Attendees will have this opportunity to interact with the authors for discussion and Q&A. These posters will be displayed Tuesday-Thursday for additional viewing opportunities during breaks and throughout the conference.
* **Q&A with EPA** – Following the Fireside Chat, a panel of EPA specialist will be available in the exhibit area to give attendees an opportunity to ask EPA questions they have about a particular sector or method, or to get help on an issue they may be experiencing within emissions inventories.

This diverse program contains a wide variety of sessions that we hope will allow each attendee to keep abreast of developments in the world of emissions data and to share professional experiences with others in the community. We think you will also enjoy being in Dallas and look forward to seeing you at the Conference!

US EPA Conference Organizers

Emission Inventory and Analysis Group

Office of Air Quality Planning & Standards

**International Emission Inventory Conference**

**WEBINAR STREAMING**

This year we are offering live streaming to those who cannot attend the training or conference. These webinars will be monitored, and questions may be asked using the “chat” function. All attendees will be muted. Registration information is available below. Please note that the Plenary, Lightning and Fireside Chat Sessions will NOT be broadcast. All times listed are Central Daylight Time.

**Monday, July 29, 2019 – Trainings (All trainings will be recorded)**

WebConf6

**International Emission Inventory Training Sessions:**

**Room: Sangar AB**

**Sessions in this room are:**

* **8:00am – 11:30am** How to Review the National Emission Inventory Using the EIS and Other Tools
* **1:00pm – 5:00pm** Conversation to Streamline the NEI

Registration URL: <https://attendee.gotowebinar.com/register/2422617041560449026>

WebConf7

**International Emission Inventory Training Sessions:**

**Room: Moreno AB**

**Session in this room is:**

* **8:00am – 5:00pm** Emissions Inventory Prep for Modeling

Registration URL: <https://attendee.gotowebinar.com/register/4788521972953379330>

WebConf8

**International Emission Inventory Training Sessions:**

**Room: Gaston AB**

**Sessions in this room are:**

* **8:00am – 11:30am** SPECIATE’s VOC and PM Speciation Profiles and Their Use to Prepare for Air Quality Modeling
* **1:00pm – 5:00pm** Inventory Guidance for Ozone, PM and Regional Haze

Registration URL: <https://attendee.gotowebinar.com/register/3898274895733935618>

WebConf9

**International Emission Inventory Training Sessions:**

**Room: Reverchon AB**

**Sessions in this room are:**

* **8:00am – 11:30am** Nonpoint Tools
* **1:00pm – 5:00pm** Oil and Gas

Registration URL: <https://attendee.gotowebinar.com/register/4662725748108050690>

**International Emission Inventory Conference**

**WEBINAR STREAMING**

**Technical Sessions** (Please refer to the agenda at <https://www.epa.gov/air-emissions-inventories/2019-international-emissions-inventory-conference-collaborative> for specific information on presentations and time).

WebConf6

**International Emission Inventory Conference**

**Room: Reunion A**

**Sessions in this room are:**

**WEDNESDAY, July 31, 2019 (8:00am – 4:55pm)**

* Mobile Session

**THURSDAY, August 1, 2019 (8:00am – 11:40am)**

* Greenhouse Gas/Remote Sensing Session

**FRIDAY, August 2, 2019 (8:00am – 11:40am)**

* Greenhouse Gas/Remote Sensing Session
* Fires and Biomass Burning Session

Registration URL: <https://register.gotowebinar.com/register/1868872199487088386>

WebConf7

**International Emission Inventory Conference**

**Room: Reunion B**

**Sessions in this room are:**

**WEDNESDAY, July 31, 2019**

* Air Quality Modeling Session **(8:00am – 2:55pm)**
* Combined Air Emissions Reporting (CAER) Session **(3:15pm – 4:55pm)**

**THURSDAY, August 1, 2019 (8:00am – 11:40am)**

* International Inventories Session

**FRIDAY, August 2, 2019 (8:00am – 11:40am)**

* Toxic/Speciation Session

Registration URL: <https://attendee.gotowebinar.com/register/5773811934789558530>

WebConf8

**International Emission Inventory Conference**

**Room: Reunion C**

**Sessions in this room are:**

**WEDNESDAY, July 31, 2019**

* Oil and Gas Session **(8:00am – 11:40am)**
* Tools Session **(1:15pm – 4:55pm)**

**THURSDAY, August 1, 2019**

* Tools Session **(8:00am – 9:40am)**
* Point/Nonpoint Session **(10:00am – 11:40am)**

**FRIDAY, August 2, 2019**

Point/Nonpoint Session **(8:00am – 11:40am)**

Registration URL: <https://attendee.gotowebinar.com/register/4944221615539613186>

**International Emission Inventory Conference**

**2019 International Emission Inventory Conference**

**Hyatt Regency at Reunion**

**July 29-August 2, 2019**

**AGENDA**

**MONDAY, JULY 29, 2019 – TRAINING SESSION – WEBINAR AVAILABLE**

**COURSES WILL BE RECORDED AND AVAILABLE AT** [**https://www.epa.gov/air-emissions-inventories/air-emissions-inventory-training**](https://www.epa.gov/air-emissions-inventories/air-emissions-inventory-training) **AFTER THE CONFERENCE.**

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| **8:00 am – 11:30 am Training Sessions** | | | |
| **Sanger AB** | **Moreno AB** | **Gaston AB** | **Reverchon AB** |
| **How to Review the National Emission Inventory Using the Emission Inventory System (EIS) and Other Tools**  *Jonathan Miller,* and *Eric Lyv,*  U.S. EPA  This half day course will include details and how-to’s for the following topics:   * EIS Report Tools * Common Features of Reports * Using Excel / Access with Reports * Common Report Issues * Things to Consider When Running Reports * 2020 CERS Schema | **Emissions Inventory Prep for Modeling**  *Alison Eyth, Caroline Farkas and Jeff Vukovich, U.S. EPA*  This full day course will review the concepts involved in preparing emissions inventories for air quality modeling of historic and future years. | **SPECIATE’s VOC and PM Speciation Profiles and Their Use to Prepare for Air Quality Modeling**  *Madeleine Strum and Casey Bray, U. S. EPA*  This half-day training provides general concepts on chemical speciation, the SPECIATE database and browser, and how to create model ready speciation inputs for a photochemical air quality model. We will focus on speciation of VOC and PM2.5 for air quality modeling. | ***Nonpoint Tools***  *Jennifer Snyder and Rich Mason, U.S. EPA; Jonathan Dorn, and David Cooley,*  *Abt Assoc*  This half day course is designed for the nonpoint inventory SLT developer, and will walk through the EPA Wagon Wheel, with a close focus on ICI and RWC combustion methods and associated input templates |
| **11:30 am – 1:00 pm LUNCH – on your own** | | | |
| **1:00 pm – 5:00 pm Training Sessions** | | | |
| **Conversation to Streamline the NEI**  *Rich Mason, U.S.EPA*  This half day hands-on workshop will be a conversation between inventory developers and EPA:   * What aspects of the EI development cycle need the most improvement from your perspective? * What are key sources or pollutants (missing or in an in-adequate state for your needs)? * What updates are needed for the AERR?  (e.g., NP activity data), What are the pain points in the development, review, submittal and QA process? | **Emissions Inventory Prep for Modeling**  *Alison Eyth, Caroline Farkas and Jeff Vukovich, U.S. EPA*  Continuation of morning training | **Inventory Guidance for Ozone, PM and Regional Haze**  *Marc Houyoux, U.S. EPA*  This half-day training will be an overview of the [Emissions Inventory Guidance for Implementation of Ozone, PM, and Regional Haze](https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf). The class should be most helpful for those who are not familiar with State Implementation Plan (SIP) inventory requirements and for those who support SIP development for areas where the attainment status has changed.  The course will include information about the legal basis for these SIPs, types of inventories required under different cases for each rule, and illustrative examples. | **Oil and Gas**  *Mike Pring and Regi Oommen, ERG, Melissa Weitz and Adam Eisele, U.S. EPA*  This half day course is designed for the inventory developer who has oil and gas in their state, and wants to know more about the types of sources in the Oil and Gas Production sector (Oil and Gas 101), provide an overview of the Oil and Gas Tool (less hands on than in the past because of the timing of the NEI), Federal regulations on oil and gas, and the GHG programs in place*.* |

**International Emission Inventory Conference**

**TUESDAY, JULY 30, 2019 – PLENARY AND LIGHTNING SESSIONS – WEBINAR NOT AVAILABLE**

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| **9:00 am – 11:00 am PLENARY SESSION** | | |
| 9:00 – 9:10 am | Welcome: Caroline Farkas and Madeleine Strum, U.S. EPA, Conference Committee | |
| 9:10 – 9:20 am | Marc Houyoux, Group Leader, Emission Inventory and Analysis Group, U.S. EPA | |
| 9:20 – 9:40 am | David Gray, Acting Regional Administrator, U.S. EPA Region 6 | |
| 9:40 – 10:10 am | David Lyon, Scientist, Environmental Defense Fund | |
| 10:10 – 10:30 am | Richard (Chet) Wayland, Director, Air Quality Assessment Division, U.S. EPA | |
| 10:30 – 11:00 am | Q&A | |
| **11:00 am – 1:00 pm LUNCH (on your own)** | | |
| **1:15 pm – 3:00 pm LIGHTNING SESSION** | | |
| 1:15 – 1:20 pm | | Welcome, Caroline Farkas, U.S. EPA, Conference Chair |
| 1:20 – 1:25 pm | | Improvements to EPA's SPECIATE Database: SPECIATE 5.0, *M. Strum, U.S.EPA* |
| 1:25 – 1:30 pm | | Changes in Mobile Inventories in the Washington, DC Region from 2011-2017 - *J. Jakuta, Government of the District of Columbia* |
| 1:30 – 1:35 pm | | Updates to Agricultural Equipment Allocation Data in MOVES Model - *A. Bollman, North Carolina DAQ* |
| 1:35 – 1:40 pm | | Development of Kansas Flint Hills Prescribed Fire Emissions Inventory - *J. Prentice, Kansas Department of Health and Environment* |
| 1:40 – 1:45 pm | | Characterizing the Impact of Poultry and Cattle Farms on Chesapeake Bay Aerosols in Baltimore, MD During the OWLETS-2 Campaign - *N. Balasus, University of Maryland, Baltimore County* |
| 1:45 – 1:50 pm | | Project-Specific Data Preparation for Air Quality Modeling: Lessons from the Phoenix Area Hot-Spot Analysis –  *J. Joo, Arizona Department of Transportation* |
| 1:50 – 1:55 pm | | Alaska Localization of EPA Emissions Data: QA/QC Checks for EPA NEI Data Based on Unique Regional Characteristics - *P. Goodfellow, Alaska Department of Environmental Conservation* |
| 1:55 – 2:00 pm | | Clark County Nevada On-Road Vehicle Classification Study - *A. DenBleyker, Eastern Research Group* |
| 2:00 – 2:05 pm | | How Collaborative was the National Emissions Collaborative? A Debrief on the Process and a Look Ahead to the Next Steps – *Z. Adelman, LADCO* |
| 2:05 – 2:10 pm | | Impact of Food Waste Diversion on Landfill Gas and Leachate from Simulated Landfills - M. *Krause, U.S. EPA* |
| 2:10 – 2:15 pm | | Carbonaceous PM in the National Emissions Inventory – *V. Rao, U.S. EPA* |
| **2:15 pm – 2:50 pm BREAK** | | |
| 2:50– 2:55 pm | | Estimates of Lead Emissions from Wildland Fires in the US, V. *Rao, U.S. EPA* |
| 2:55 – 3:00 pm | | Airport Inventories – What are our obstacles and how can we overcome them? - *L. Stevens, New York State Department of Environmental Conservation* |
| 3:00 – 3:05 pm | | Integration of the Air Pollutant Emissions Inventory with the National Greenhouse Gas Inventory for the Transport Sector - *D. Smith, Environment and Climate Change Canada* |
| 3:05 – 3:10 pm | | Better Permits Make Better Emissions Inventories - *W. Smith, K2 Environmental Consulting, LLC* |
| 3:10 – 3:15 pm | | Recent SMOKE Enhancements and Its Applications - *BH Baek, University of North Carolina* |
| 3:15 – 3:20 pm | | Updates to Version 4 of the Biogenic Emissions Land Use Database (BELD4) for Canada and Impacts on Biogenic VOC Emissions - *J. Zhang, Environment and Climate Change Canada* |
| 3:20 – 3:25 pm | | Study on Real-World Formation of Carbon Dioxide Emissions from Heavy-Duty vehicles Using Work-Based Window Method *- C. Vardhireddy, West Virginia University* |
| 3:25 – 3:30 pm | | A Comparison of Mobile Input Parameters between Two MOVES-Based National Emission Inventories of 2011 and 2014 - *J.-S. Lin, Virginia Department of Environmental Quality* |
| 3:30 – 3:35 pm | | Simulation and Analysis of the DMS and Sulfate during the C-SOLAS SABINA Campaign - A. Taoussi, Université du Québec à Montréal |
| 3:35 – 3:40 pm | | Real-World Elemental Carbon (EC) Emission Factors of Diesel Vehicles in China, *X. Shen - Beijing Technical and Business University* |
| 3:40 – 3:45 pm | | Closing Remarks, Caroline Farkas, Conference Chair |
| **4:00 pm – 5:30 pm POSTER SESSION – EXHIBIT VIEWING** | | |

**International Emission Inventory Conference**

**List of Poster Presentations (\* indicates Student Poster) – WEBINAR NOT AVAILABLE**

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| **#** | **Poster Title** | **Presenter** | **Organization** |
| 1 | A Spatio-Temporal Approach to Improve the Carbon Stock Estimates of Woody Biomass in Croplands in Canada | *A. Thiagarajan* | *Environment and Climate Change Canada* |
| 2 | Agricultural Production, Distribution and the Demands for Pesticides in Nigeria | *M.A. Oke* | *Michael Adedotun Oke Foundation* |
| 3 | Improvements to the National Emission Inventory: Crop Residue Burning and Rangeland Burning | *G. Pouliot* | *U.S. EPA* |
| 4 | \*The Impact of Regional Agricultural Emissions on Urban Aerosol Chemistry in the Eastern U. S. | *K. Ball* | *University of Maryland* |
| 5 | A Generic Framework to Estimate Greenhouse Gases Emissions from Land Use Changes in Canada | *L. Lapointe-Elmrabti* | *Environment and Climate Change Canada* |
| 6 | EPA's Emissions & Generation Resource Integrated Database (eGRID): Addition of PM Emissions Rates | *J. Dorn* | *Abt Associates* |
| 7 | Reducing Uncertainty in Air Pollution Émissions Inventory of India | *A. Datta* | *The Energy and Resources Institute New Delhi, India* |
| 8 | A Preliminary Assessment of the First Iranian National Emission Inventory (INEI) for 8 Large Cities: Role and Importance of Mobile Sources | *V. Hosseini* | *University of Technology, Tehran, Iran* |
| 9 | BOEM’s 2017 Emission Inventory and Trends Analysis for the Gulf of Mexico Outer Continental Shelf | *B. Do* | *Eastern Research Group* |
| 10 | Comparing Onroad Age Distributions Derived from Remote Sensing Studies to Registration-Based Age Distributions for Light-Duty Vehicles Used in the NEI | *C. Toro* | *U.S. EPA* |
| 11 | Enhanced Modelling Approach for Quantifying Fugitive Emissions from Canada’s Upstream Oil and Gas Industry | *S. Smyth* | *Environment and Climate Change Canada* |
| 12 | Psemplot Emissions Visualizer | *J. Beidler* | *General Dynamics Information Technology* |
| 13 | Recent Improvements to SMOKE Temporal Profile and Spatial Surrogate Files for Canada | *Q. Zheng* | *Environment and Climate Change Canada,* |
| 14 | \*Towards Refining Estimates of Ammonia Emissions: Modeling Framework Preparations | *M. Momeni* | *Drexel University* |
| 15 | U.S. EPA Greenhouse Gas Data on Petroleum and Natural Gas Systems | *A. Eisele* | *U.S. EPA* |
| 16 | \*Assessing the Impacts of Emissions from Oil and Gas Extraction on Urban Ozone and Associated Health Risks | *C.**Lyu* | *Drexel University* |
| 17 | Use of National Emissions Inventory Data for Development of Regulatory Reporting Requirements in Canada | *A. Monette* | *Environment and Climate Change Canada* |
| 18 | Emission Factor Review of Condensible Particulate Matter (CPM) from Stationary Sources | *J. Mangino* | *U.S. EPA* |
| 19 | Canada’s Inventory of Facility-Reported Pollutant Releases: The National Pollutant Release Inventory | *J. Underhill* | *Environment and Climate Change Canada* |
| 20 | What’s New with EPA’s Risk and Technology Review (RTR) Program | *S. Enoch* | *Eastern Research Group* |
| 21 | Introduction to Canada’s Emissions Inventories | *A. Monette* | *Environment and Climate Change Canada* |
| 22 | \*Study on Real-World Formation of Carbon Dioxide Emissions from Heavy-Duty Vehicles Using Work-Based Window Method | *C. Vardhireddy and*  *S.S. Guda* | *West Virginia University* |
| 23 | Extending Air Monitoring: Simultaneous Analysis of Ozone Precursors, Air Toxics and Carbonyls | *R. Li* | *Markes International* |
| 24 | \*An Analysis of Paved Road Dust Profiles in EPA’s SPECIATE Database | *V. Rao* | *U.S. EPA* |
| 25 | CANCELLED \*Low-cost, High-resolution Sensor Nodes for Air Quality Monitoring in Logistically Difficult Environments: Ghana Case Study | *C. G. Hodoli* | *Cranfield University, United Kingdom* |
| 26 | How the Integration of Farm Management Information Changes Our Understanding of Greenhouse Gas Emissions from the Livestock Industry | *C. Fleming* | *Federal Canadian Government* |
| 27 | ECHO Clean Air Tracking Tool (ECATT) | *J. Yourish* | *U.S. EPA* |
| 28 | Impact of Using Different Emissions on Canadian Air Quality Forecasts | *R. Mashayekhi* | *Environment and Climate Change Canada* |
| 29 | Assessment of Important SPECIATE Profiles in EPA’s Emissions Modeling Platform and Current Data Needs | *C. Bray* | *U.S. EPA* |

**International Emission Inventory Conference**

**WEDNESDAY, JULY 31, 2019 – TECHNICAL SESSIONS – WEBINAR AVAILABLE**

7:00 am – 5:00 pm Registration – Trinity A

8:00 am – 5:00 pm Exhibitor and Poster Viewing – Reunion EF

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| **8:00 am – 9:40 am Technical Sessions** | | |
| **Reunion A** | **Reunion B** | **Reunion C** |
| Mobile Session *Laurel Driver and Sarah Roberts,  U.S. EPA*  8:00 – 8:25 am - Collaboration to Improve the Onroad Sector of the 2017 NEI –  *A. DenBleyker, Eastern Research Group, Inc*  8:25 – 8:50 am *-* Using Mobile Measurements to Update Onroad Transportation Emission Inventory – *S. Zhang, Cornell University*  8:50 – 9:15 am *-* Use of Telematics Data to Update the Heavy-Duty Vehicle Mileage –  *A. DenBleyker, Eastern Research Group* 9:15 – 9:40 am *-* Planned Updates to EPA MOVES Emission Model for Heavy-  Duty Onroad Vehicles – *J. Han, U.S. EPA* | Air Quality Modeling Session *Alison Eyth, US EPA; Zac Adelman, LADCO*  8:00 – 8:25 am - Accounting for Organic Compound Volatility in Standard Emissions Speciation Profiles, Databases and Models –*G. Pouliot, U.S. EPA*  8:25 – 8:50 am - Parameterization of MOVES Emission Factors Lookup Tables in SMOKE - *B.H. Baek, University of North Carolina*  8:50 – 9:15 am - Inventory MOVES with Hourly Meteorology for Use in Air Quality Models –*G. Grodzinsky, Georgia Dept of Natural Resources*  9:15 – 9:40 am - SMOKE Updates: MOVES Processing Enhancements and New Spatial Surrogates Tool – *B. H. Baek, University of North Carolina* | Oil and Gas Session *Regi Oommen, ERG; Tom Moore, WESTAR* 8:00 – 8:25 am - U.S. Upstream Oil and Gas Methane Emissions Estimated with Inventory Model Incorporating Site-and Component-Level Data – *D. Lyon, Environmental Defense Fund*  8:25 – 8:50 am – Collaborative Steps to Improve Oil and Gas Emission Inventories in Several Western States – *J. Grant, Ramboll, Inc.*  8:50 – 9:15 am - Federal Lands Greenhouse Gas Emissions and Sequestration – A Modified EPA Methodology – *M. Merrill, U.S. Geological Survey*  9:15 – 9:40 am - Development of the 2016 Nationwide Oil and Gas Emissions Inventory: Data Collection, Emissions Estimation, and Spatial, Speciation, and Temporal Modeling Surrogates – *R. Oommen Eastern Research Group* |
| **9:40 – 10:00 BREAK** | | |
| Mobile Session *Laurel Driver and Sarah Roberts,  U.S. EPA*  10:00 – 10:25 am - - MOVES Light-Duty Emission Rate Evaluation in the Context of Reconciling Modeled and Ambient NOx –  *C. Toro, U.S. EPA*  10:25 – 10:50 am - Emissions Impacts of Electrifying Passenger Cars in Texas – *C. Kite, Texas Commission on Environmental Quality*  10:50 – 11:15 am - Estimation of Mobile Source Toxic Emissions and Application in Planning and Policy – *R. Cook, U.S. EPA*  11:15 – 11:40 am -  Environment and Climate Change Canada’s Changes to the NONROAD model – *B. Taylor, Environment and Climate Change Canada* | Air Quality Modeling Session *Alison Eyth, US EPA; Zac Adelman, LADCO*  10:00 – 10:25 am – The National Emissions Collaborative: A Cooperative Approach to Developing Emissions Modeling Platforms –  *Z. Adelman, LADCO*  10:25 – 10:50 am – Development and Evaluation of the Biogenic Emission Inventories for the 2016 Collaborative Modeling Platform – *D. Boyer, Texas Commission of Environmental Quality*  10:50 – 11:15 am – Development of a Year 2016 Fire inventory for United States through a Multi-Agency Inventory Collaboration Effort – *J. Vukovich, U.S. EPA*  11:15 – 11:40 am - The 2016 National Emissions Inventory Collaborative: Modeling with the Beta Platform –*E. Zalewsky, New York State Department of Environmental Conservation* | Oil and Gas Session *Regi Oommen, ERG; Tom Moore, WESTAR*  10:00 – 10:25 am –New Process for Collecting Oil and Gas Production Site Inventories –  *B. Way, Wyoming Air Quality Division*  10:25 – 10:50 am – EPA's Nonpoint Oil and Gas Emissions Estimation Tool Improvements for 2017 *– M. Pring, Eastern Research Group*  10:50 – 11:40 am – *Panel Discussion led by*  *A. Bar-Ilan, Ramboll*. A Panel discussion with representatives from industry, EPA, and state inventory developers, will address the key needs and focuses of oil and gas emission inventories, the reporting of emissions by operators to state, federal and regional agencies, and chief concerns in developing oil and gas emission inventories. Panelists TBD |
| **11:40 – 1:15 pm LUNCH (on your own)** | | |

**International Emission Inventory Conference**

**WEDNESDAY, JULY 31, 2019 – TECHNICAL SESSIONS – WEBINAR AVAILABLE**

7:00 am – 5:00 pm Registration – Trinity A

8:00 am – 5:00 pm Exhibitor and Poster Viewing – Reunion EF

|  |  |  |
| --- | --- | --- |
| **1:15 – 5:00 pm Technical Sessions** | | |
| **Reunion A** | **Reunion B** | **Reunion C** |
| Mobile Session *Laurel Driver and Sarah Roberts, U.S. EPA* 1:15 – 1:40 pm - Towards an AIS Based Marine Emissions Inventory Model –*M. Aldridge, U.S. EPA*  1:40 – 2:05 pm – A Statewide Commercial Marine Vessel AIS-Based Emission Inventory – *S. Cone, Delaware Department of Natural Resources and Environmental Control*  2:05 – 2:30 pm – Methods to Estimate Emissions for Vessels Equipped with Category 1&2 Propulsion Engines Based on AIS Activity Data – *I. Brown, Eastern Research Group*  2:30 – 2:55 pm -Data Quality Tools Applied to AIS Data Enhance Accuracy of Emissions Inventories – *R. Billings, Eastern Research Group* | Air Quality Modeling Session *Alison Eyth, US EPA; Zac Adelman, LADCO*  1:15 – 1:40 pm – Forecasting Point Source Emissions – *K. Narasimhan, Virginia Dept of Environmental Quality*  1:40 – 2:05 pm – Introduction to the MARAMA Inventory Projection Spreadsheet Tool – *S. McCusker, MARAMA*  2:05 – 2:30 pm – MANE-VU Modeling Inventory – *J. Jakuta, Government of the District of Columbia*  2:30 – 2:55 pm - Development of the 2028 Emissions Inventory for Regional Haze Modeling for the Ten Southeastern States –  *R. Oommen, Eastern Research Group* | Tools Session  *Molly Zawacki, U.S. EPA and*  *James Beidler, General Dynamics IT*  1:15 – 1:40 pm - Using SLEIS for Efficient Emissions Inventory Management – *B. Smith, Windsor Solutions, Inc.*  1:40 – 2:05 pm – Enhanced WebFIRE Table for Online Emissions System – *S. Hanks, Utah Division of Air Quality*  2:05 – 2:30 pm – Arizona Regional Emissions Inventory Database Collaboration –  *J. Uebelher, Maricopa County Air Quality Department*  2:30 – 2:55 pm - Updates to the EPA Facility Widget for Sub-Facility Details **–**  *M. R. Houyoux, U.S. EPA* |
| **2:55 – 3:15 pm BREAK** | | |
| Mobile Session *Laurel Driver and Sarah Roberts, U.S. EPA*  3:15 – 3:40 pm – Advancing Nonroad Model Development through Data Partnerships –  *S. Roberts, U.S. EPA*  3:40 – 4:05 pm – Developing Updated Activity Inputs for Nonroad Equipment – *J. Warila, U.S. EPA*  4:05 – 4:30 pm – Building National High-Resolution Rail Inventories Through Regional Collaboration – *M. Janssen, LADCO*  4:30 – 4:55 pm - Updates to Agricultural Equipment Allocation Data in MOVES Model - *A. Bollman, North Carolina DAQ* | Combined Air Emissions Reporting (CAER) Session  *Julia Gamas, U.S. EPA; Tammy Manning, North Carolina DENR*  3:15 – 3:40 pm – The Combined Air Emissions Reporting (CAER) project Common Emissions Form – *J. Gamas, U.S. EPA*  3:40 – 4:05 pm – Combining and Streamlining Data: How SLTs Could Get More Out of CAER – *T. Manning, North Carolina Dept of Environmental Quality*  4:05 – 4:30 pm – SLT/NEI/TRI Research Project: Program Comparisons and Recommendations for CAER – *M. Strum, U. S. EPA*  4:30 – 4:55 pm - Demonstration of the Maine Air Inventory Reporting (Information) System (MAIRIS) – *S. Knapp, Maine Dept of Environmental Protection* | Tools Session  *Molly Zawacki, U.S. EPA and*  *James Beidler, General Dynamics IT*  3:15 – 3:40 pm – Changes to the Emission Inventory System (EIS) for 2020 – *J. Miller, U.S. EPA*  3:40 – 4:05 pm – National Residential Wood Combustion Survey Results – *D. Cooley, Abt Associates*  4:05 – 4:30 pm – ECHO Clean Air Tracking Tool (ECATT) - *J. Yourish, U.S EPA*  4:30 – 4:55 pm - Reflecting on Progress Since the 2005 NARSTO Emissions Inventory Report –*G. Pouliot, U.S. EPA* |
| **ADJOURNED FOR THE DAY** | | |

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**International Emission Inventory Conference**

**THURSDAY, AUGUST 1, 2019 – TECHNICAL SESSIONS – WEBINAR AVAILABLE**

7:00 am – 5:00 pm Registration – Trinity A

8:00 am – 3:00 pm Exhibitor and Poster Viewing – Reunion EF

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| **8:00 am – 11:40 am Technical Sessions** | | |
| **Reunion A** | **Reunion B** | **Reunion C** |
| Greenhouse Gas/Remote Sensing Session *Joe Mangino, U.S. EPA and*  *Tammy Manning, North Carolina DEQ*  8:00 – 8:25 am - Vulcan and Hestia: Quantification of High-Resolution, Bottom-Up Fossil Fuel CO2 Emissions for the Nation and US Cities – *G. Roest, Northern Arizona University* 8:25 – 8:50 am *-* EPA's Emissions & Generation Resource Integrated Database (eGRID): Addition of PM Emissions Rates *– J. Dorn, Abt Associates*  8:50 – 9:15 am *–* Development of North Carolina's GHG Inventory – *A. Bollman*, *North Carolina Dept of Environmental Quality*  9:15 – 9:40 am *-* Top-Down Estimate of Black Carbon Emissions for City Clusters Using Ground Observations – *Y. Zhao, Nanjin University, China* | International Inventories Session *Venkatesh Rao, U.S. EPA and*  *Anne Monette, Environment and Climate Change Canada*  8:00 – 8:25 am – Canada’s National Pollutant Release Inventory – *J. Underhill, Environment and Climate Change Canada*  8:25 – 8:50 am - Introduction to Canada’s Emission Inventories – *D. Smith, Environment and Climate Change Canada*  8:50 – 9:15 am *–* - Use of National Emissions Inventory Data for Development of Regulatory Reporting Requirements in Canada – *A. Monette, Environment and Climate Change Canada*  9:15 – 9:40 am *–* Using Pollutant Release and Transfer Registers to Support Global Sustainability – *C. Briere, U.S. EPA* | Tools Session  *Molly Zawacki, U.S. EPA and*  *James Beidler, General Dynamics IT*  8:00 – 8:25 am - Updates to Version 4 of the Biogenic Emissions Land Use Database (BELD4) for Canada and Impacts on Biogenic BOC Emissions *– J. Zhang, Environmental and Climate Change Canada* 8:25 – 8:50 am *-* Novel Tools for Emissions Inventory Development and Verification –  *R. Ames, Colorado State University*  8:50 – 9:15 am *–* Developing a Transparent and Comprehensive Estimate of Upstream Emissions for 2016 – *M. Zawacki, U.S. EPA*  9:15 – 9:40 am *-* CMAQ Emissions Calculator Toolkit – *A. Eilbert, U.S. Dept of Transportation* |
| **9:40 – 10:00 am BREAK** | | |
| Greenhouse Gas/Remote Sensing Session *Joe Mangino, U.S. EPA and*  *Tammy Manning, North Carolina DEQ*  10:00 – 10:25 am - LULUCF Treatment in Top Down Economic Analyses of Climate Change – *E.R. Toledo Neto, Ministry of Economy, Brasilia, Brazil*  10:25 – 10:50 am – Impact of Food Waste Diversion on Landfill Gas and Leachate from Simulated Landfills – *M. Krause, U.S. EPA*  10:50 – 11:15 am - Better Permits Make Better Emission Inventories – *W. Smith, K2 Environmental Consulting Inc.*  11:15 – 11:40 am - Improving Methane Emission Estimates with Airborne Active Remote Sensing – *B. Farris, Ball Aerospace & Technologies Corp* | International Inventories Session *Venkatesh Rao, U.S. EPA and*  *Anne Monette, Environment Canada*  10:00 – 10:25 am – Annual Vehicle Emissions at U.S.-Mexico Border Crossing Inventory –  *J. Koupal, Eastern Research Group*  10:25 – 10:50 am – Using International Emissions Inventories for the Validation of Global Life Cycle Assessment Databases –  *C. Mutel, Paul Scherrer Institut, Switzerland*  10:50 – 11:15 am – Assessment of Emissions by Road Transport Sector in Azerbaijan –  *S H. Hasanov, Azerbaijan National Academy of Sciences*  11:15 – 11:40 am – Emission Inventory by Diesel Locomotive Evaluating the Economic Policy for Iran National Railroad Network  S. Dabirinejad, University of Technology, Tehran Polytechnic | Point/Nonpoint Session  *Rich Mason, U.S. EPA and*  *David Cooley, Abt Associates*  10:00 – 10:25 am - New Approach for 2017 Nonpoint National Emission Inventory Development – *R. Mason, U.S. EPA*  10:25 – 10:50 am – Updates to Industrial, Commercial, and Institutional Emissions Estimation Methods – *D. Cooley, Abt Associates*  10:50 – 11:15 am - Updates on Residential Wood Combustion Surveys – *A. Kovacevic, Minnesota Pollution Control Agency*  11:15 – 11:40 am - *-* A New Auto Body Refinishing Emission Factor Created from Statewide Industry Surveys – *S. Cone, Delaware Department of Natural Resources and Environmental Control* |
| **11:40 am – 1:15 pm LUNCH (On your own)** | | |

**International Emission Inventory Conference**

**THURSDAY, AUGUST 1, 2019 – TECHNICAL SESSIONS – WEBINAR NOT AVAILABLE**

7:00 am – 5:00 pm Registration – Trinity A

8:00 am – 3:00 pm Exhibitor and Poster Viewing – Reunion EF

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| **1:15 pm – 2:45 pm FIRESIDE CHAT and POSTER AWARDS – Reunion ABC** | | |
| 1:15 – 2:45 pm | The Fireside Chat is a new element of the International Emissions Inventory Conference that will bring together a few leaders in the emission inventory community for a casual conversation about the future of emission inventories. There will be opportunities during the week to submit questions and topics to be discussed at this alternate plenary session, as well as opportunities during the session for audience participation. As we continue the conference theme of collaboration toward common science and policy goals, it is important that as a community we discuss where we have been and where we are going. Please join us for this exciting new element of our conference. We will conclude the session with the Poster Awards. | Reunion ABC |
| **2:45 pm – 3:15 pm BREAK** | | |
| 3:15 – 4:45 pm | Q&A with EPA  Topic specialists will be available to answer questions related to the topics below. Conference attendees are encouraged to submit questions ahead of time during the registration process or by email to [2019EIC@epa.gov](mailto:2019EIC@epa.gov).   |  |  |  | | --- | --- | --- | | ***Table No*** | ***Topic*** | ***EPA Staff and Contractors*** | | *1* | *Fires/Livestock* | *Tesh Rao/James Beidler* | | *2* | *Combined Air Emissions Reporting (CAER)* | *Julia Gamas* | | *3* | *Emission Inventory System* | *Jon Miller and Eric Lyv* | | *4* | *Toxics/SPECIATE* | *Madeleine Strum* | | *5* | *Nonpoint Wagon Wheel* | *Abt Associates* | | *6* | *Oil and Gas* | *Eastern Research Group* | | *7* | *General Nonpoint Method Advisory (NOMAD) (Committee)* | *Jennifer Snyder* | | *8* | *Residential Wood Combustion (RWC); Industrial Commercial/Institutional (ICI) /General NEI* | *Rich Mason* | | *9* | *Air Quality Modeling* | *Caroline Farkas, Jeff Vukovich, Alison Eyth* | | *10* | *Mobile and CMV Sources* | *Sarah Roberts* | | Reunion EF |

**International Emission Inventory Conference**

**FRIDAY, AUGUST 2, 2019 – TECHNICAL SESSIONS – WEBINAR AVAILABLE**

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| **8:00 am – 11:40 am Technical Sessions** | | |
| **Reunion A** | **Reunion B** | **Reunion C** |
| Greenhouse Gas/Remote Sensing Session *Joe Mangino, U.S. EPA and*  *Tammy Manning, North Carolina DEQ*  8:00 – 8:25 am - Magnitude and Trend of NOx Emissions Constrained by OMI – *Z. Qu, University of Colorado Boulder* 8:25 – 8:50 am*-* Decadal Changes in Global NOx, CO, and SO2 Emissions Derived from Multi-Model Multi-Constituent Satellite Data Assimilation – *K. Miyazaki, California Institute of Technology*  8:50 – 9:15 am *–* *-* Broad-Area Emission Surveys with Airborne Remote Sensing –  *D. Tratt, The Aerospace Corporation* | Toxics/Speciation Session *Madeleine Strum and Stephanie Griffin, U.S. EPA*  8:00 – 8:25 am - Improvements to EPA's Speciate Database: Speciates 5.0, *M. Strum, U.S. EPA* 8:25 – 8:50 am*-* Impact of Wildland Fire Combustion phase on PM and VOC speciation and EPA’s National Emissions Inventory –  *V. Rao, U.S. EPA*  8:50 – 9:15 am *–* Lessons Learned: Creating an Air Toxics Emissions Reporting Program for  Oregon – *B. Albertson, Oregon Department of Environmental Quality*  9:15 – 9:40 am *-* Overview of the 2014 National Air Toxics Assessment (NATA) –  *T. Palma, U.S. EPA* | Point/Nonpoint Session  Rich Mason, U.S. EPA and  David Cooley, Abt Associates  8:00 – 8:25 am - Fertilizer NH3 Emission Estimates for 2017 National Emissions Inventory Using an Agricultural Ecosystem Model and an Air Quality Model – *J. Bash, U.S. EPA* 8:25 – 8:50 am *-* Methodology for Estimating US Livestock Populations for Use in National Emissions Inventory Development –  *K. Erdquist, Eastern Research Group*  8:50 – 9:15 am *–* Data-Driven Modeling of Spatially Explicit Air Pollutant Inventories for Agricultural and Forestry Feedstock Production – *R. Hanes, National Renewable Energy Laboratory*  9:15 – 9:40 am- Characterizing the Impact of Poultry and Cattle Farms on Chesapeake Bay Aerosols in Baltimore, MD During the OWLETS-2 Campaign - *N. Balasus, University of Maryland, Baltimore County* |
| **9:40 – 10:00 am BREAK** | | |
| Fires and Biomass Burning Session  *Jeff Vukovich and Joseph Wilkins,*  *U.S. EPA*  10:00 – 10:25 am - New Developments with the Fire Inventory from NCAR (FINN) Emissions – *E. McDonald-Buller, University of Texas at Austin*  10:25 – 10:50 am – Performance Assessment of Fire Inventory from the National Center for Atmospheric Research (FINNv2) Wildfire Emissions Estimates Using Satellite Aerosol Observations – *N. Pavlovic, Sonoma Technology*  10:50 – 11:15 am - Development and Evaluation of Wildland Fire Emission Inventories for Regional Haze Planning –  *M. Mavko, WESTAR/WRAP*  11:15 – 11:40 am - Exploring the Vertical Distribution of Wildland Fire Smoke in CMAQ – *J. Wilkins, U.S. EPA* | Toxics/Speciation Session *Madeleine Strum and Stephanie Griffin, U.S. EPA*  10:00 – 10:25 am - Polychlorinated Biphenyl (PCBs) Levels and Ecological Risk Assessment in Ambient Air of an Urban Environment with Intensive Gas Flare. – *S. Uzoekwe, Federal University Otuoke, Bayelsa State Nigeria*  10:25 – 10:50 am – Tracking Mercury Emissions from Products as Part of Canada’s Air Pollutant Emission Inventory – *B. Sullivan, Environment and Climate Change Canada*  10:50 – 11:15 am - What’s Available Through Toxics Release Inventory Data? – *S. Griffin, U.S. EPA*  11:15 – 11:40 am - How Toxics Release Inventory Data Have Been Used by Academics and Researchers – *C. Briere, U.S. EPA* | Point/Nonpoint Session  *Rich Mason, U.S. EPA and*  *David Cooley, Abt Associates*  10:00 – 10:25 am - Analysis and Use of Point Source Emission Rates from the National Emissions Inventory – *M. Houyoux, U.S. EPA*  10:25 – 10:50 am – A Rural Tribal Alaska Emissions Inventory: Building a Community Centric Approach to Defining CAP and GHG Emissions -*P. Goodfellow, Alaska Department of Environmental Conservation*  10:50 – 11:15 am - - Alaska Localization of EPA Emissions Data: QA/QC Checks for EPA NEI Data Based on Unique Regional Characteristics - *P. Goodfellow, Alaska Department of Environmental Conservation* |
| **CONFERENCE ADJOURNED – THANK YOU!** | | |

**International Emission Inventory Conference**

**LIGHTNING ROUND ABSTRACTS**

**Chairs: Caroline Farkas and Jennifer Snyder, U.S. EPA**

**Tuesday, July 30, 2019**

1:20 – 1:25 pm - **Improvements to EPA’s SPECIATE Database: SPECIATE5.0 -** *M. Strum, M. Menetrez, U.S. EPA; F. Divita and Y. Hsu, Abt Associates*

SPECIATE is a repository of speciation profiles that provide composition data for the volatile organic gas and particulate matter emission sources. These data provide the necessary inputs for photochemical air quality models, and for estimating black carbon inventories, and they may also be used in source apportionment and estimation of air toxics emissions.

EPA updates the SPECIATE database every 2-3 years. The most recent update produced SPECIATE 5.0 . This update appends over 400 speciation profiles to the previous version (SPECIATE4.5). In addition to adding PM and VOC composition data, EPA has improved the database structure, and has developed a new browser tool using Qlik software to view and access profiles. EPA is also providing workbooks that include calculations made to convert the raw data into speciation profiles.

This presentation will highlight the updates made for SPECIATE 5.0 and will focus on the browser

1:25 – 1:30 pm - **Changes in the Mobile Emissions Inventory in the Washington, DC Region from 2011 - 2017 -** *J. Jakuta, Government of the District of Columbia; H. Ashenafi, E. Bull, D. Healy, K. Knight, S. McCusker*

Mobile sources produce much of the Oxides of Nitrogen (NOX), Fine Particulate Matter (PM2.5), and Hazardous Air Pollutant (HAP) emissions in the District of Columbia and surrounding counties in Maryland and Virginia. The Washington area is currently in nonattainment for ozone under the current National Ambient Air Quality Standard (NAAQS), in maintenance PM2.5 for under the 1997 NAAQS, and, has census tracts with a cancer risk of up to 45 in a million according to the 2014 National Air Toxics Assessment. These air quality problems make understanding the mobile emissions inventory in the Washington, DC region critical. We will be reviewing onroad and nonroad mobile inventories for 2011, 2014, and 2017 using the current version of the Motor Vehicle Emission Simulator (MOVES 2014b), as well as, the emissions from the National Emissions Inventory (NEI) produced in those years. This will allow for us to see how both emissions have trended and how the state-of-the-art models have affected emissions estimates.

1:30 – 1:35 pm - **Updates to Agricultural Equipment Allocation Data in MOVES Model –** *A. Bollman and K. King, North Carolina Department of Air Quality*

The U.S. Environmental Protection Agency (EPA)’s MOVES model provides the ability for model users to estimate county-level emissions from equipment that is generally operated off of public roads. This equipment is classified as part of the nonroad emissions sector, and includes equipment used in agricultural operations. The current MOVES model allocates the estimated national population of agricultural equipment, and by extension, national agricultural emissions, to counties using county-level data for a surrogate indicator of agricultural activity. This indicator, the total acres of crops harvested in 2002, is outdated, and possibly less representative of agricultural activity than other available surrogates. For this effort, the North Carolina Division of Air Quality (NC DAQ) has developed an updated set of county allocation factors representing the most currently available official government statistics on fuel expenditures for agricultural production. The purpose of this (lightning talk/podium presentation) is to describe NC DAQ’s methods for developing updated county-level fuel expenditure data for allocating agricultural equipment/emissions in MOVES. The NC DAQ will also present the results of this effort, focusing on comparisons between the current MOVES model allocations and the proposed new model allocations.

1:35 – 1:40 pm - **Development of Kansas Flint Hills Prescribed Fire Emissions Inventory** – *J. Prentice Kansas Department of Health and Environment*

Prescribed burning with the Kansas Flint Hills is conducted annually to maintain the prairie ecosystem, provide improved forage for cattle, and reduce wildfire risk. The annual burning has historically occurred from mid-March into early May with a typical year having approximately 2 million acres of the native prairie within the Kansas Flint Hills subjected to prescribed fire. The Kansas Department of Health and Environment (KDHE) Bureau of Air has utilized MODIS satellite imagery to analyze daily images during the annual prescribed burning to determine number of acres burned across the Kansas Flint Hills counties. This top down remote sensing approach can provide a more accurate emissions inventory and will be used to generate data for a new Event Category Source Classification Code (SCC) titled ‘Prescribed Rangeland Burning – Tallgrass Prairie’. This new Tallgrass Prairie Burning SCC will be utilized beginning with the 2016 Inventory Collaborative and the 2017 National Emissions Inventory (NEI). Prior emission inventories misrepresented the annual prescribed fires as non-point agricultural burning and event wildland fires, both wildfire and prescribed fire. The analyzed acres burned are spatially and temporally allocated based upon satellite analysis date and location, and emission totals are generated utilizing SmartFire/BlueSky modeling in coordination with the Environmental Protection Agency (EPA) and partners.

**International Emission Inventory Conference**

**LIGHTNING ROUND ABSTRACTS**

**Chairs: Caroline Farkas and Jennifer Snyder, U.S. EPA**

1:40 – 1:45 pm - **Characterizing the Impact of Poultry and Cattle Farms on Chesapeake Bay Aerosols in Baltimore, MD During the OWLETS-2 Campaign -** *N. Balasus, University of Maryland*

This study investigated the impact of livestock farms in relative proximity to the Chesapeake Bay on aerosol composition, acidity, and liquid water content during the OWLETS-2 (Ozone Water-Land Environmental Transition Study) campaign. Measurements of inorganic PM2.5 composition, gas-phase ammonia, and an array of meteorological components were undertaken at the Hart-Miller Island supersite, which lies east of Baltimore on the Chesapeake Bay. The location of the measurement site was important for multiple reasons, primarily its proximity to cattle and poultry farms but also the influence of the bay as a source/sink of gases and the potential to induce bay-breeze circulations. During this study, multiple spikes in concentration of particle-phase nitrate and gas-phase ammonia were observed and associated with potentially agricultural sources, including poultry farms on the eastern shore of Maryland and cattle farms in southeastern Pennsylvania. Sources were identified through a combination of HYSPLIT back trajectories, onsite Wind LIDAR measurements, and onsite surface wind measurements. As a result of these agricultural sources and the nearby Chesapeake Bay, the median aerosol pH for this study was 2.31, which was higher (less acidic) than the median aerosol pH predicted for a site in downtown Baltimore during the summer (1.27). Additionally, pH and aerosol liquid water did not exhibit strong diurnal variations, in contrast to other sites in the eastern U.S. during the summer. These results suggest a strong influence of the Chesapeake Bay and surrounding agricultural activity on aerosol chemistry.

1:45 – 1:50 pm - **Project-Specific Data Preparation for Air Quality Modeling: Lessons from the Phoenix Area Hot-Spot Analysis –** *J. Joo, Arizona Department of Transportation*

To meet transportation conformity requirements, project level hot-spot analyses are required for certain transportation projects in PM or CO nonattainment and maintenance areas. For the quantitative hot-spot analysis, EPA MOVES and air dispersion models need to be developed and they require project-specific input data. However, it has been a heavy burden for practitioners not only to obtain the data but also to modify them to meet the requirements of such programs. By reviewing a hot-spot analysis completed for a highway project in Phoenix metropolitan area, this study examines the data preparation process, addresses the associated problems, and finally suggests a possible data processing program. Recently, Arizona Department of Transportation (ADOT) conducted a project level hot-spot analysis for proposed extension of State Route Loop 303 (SR 303L) (see the attached figure). Since the project location is within PM10 nonattainment and CO maintenance area, ADOT developed MOVES and CAL3QHCR (for PM10) and CAL3QHC (for CO) models for the analysis. The input data for the models were provided by the Phoenix area MPO – Maricopa Association of Governments (MAG), but they must be modified for the project-level models because MAG originally created them for its regional conformity analysis. ADOT used temporary modification methods to solve this issue but recognized that it is crucial to develop a complete practical tool. From this experience, a methodological scheme has been developed for the tool which can easily transform the regional data into the appropriate input formats for project-level models.

1:50 - 1:55 pm - **Alaska Localization of EPA Emissions Data: QA/QC Checks for EPA NEI Data Based on Unique Regional Characteristics** -

*P. Goodfellow, Alaska Department of Environmental Conservation*

As part of ADEC’s responsibilities to participate in the triennial National Emissions Inventory (NEI), DEC personnel reviewed EPA’s modelled emissions data based on population size characteristics of the continental United States. Because of Alaska’s unique geography and infrastructure arrangements, ADEC reviewed 2016 modelling and NEI 2017 data from a practical sense viewpoint and understand how the agency could identify future projects with the aim of assisting EPA in developing better datasets. The EPA provided inventories, including information on long haul-truck hoteling, and non-road commercial operations (loggings, railroad and agriculture operations), which were inspected by DEC personnel along with outside contractors, comparing activity locations to known infrastructure, local conditions, and whether the community was located on the road/rail system. As a result, ADEC was able to identify several shortcomings of EPA’s generic datasets. EPA’s datasets had semi-truck hoteling occurring in locations, such as rural Southwest Alaska, without road access and with limited port facilities where long-haul trucks would not be hoteling. In addition, we identified instances of logging occurring in areas with no logging industry because of a lack of trees or in agriculture data where no agriculture existed. Lastly, in the case of railroad maintenance we found instances where EPA had allocated railyard emissions data in counties that had no rail operations. Through these findings, ADEC will be able to identify projects to better define its emissions and work with the EPA on more effective modeling for Alaska. These findings should also assist DEC in our Regional Haze modeling, as we begin working on SIP writing.

1:55 – 2:00 pm - **Clark County Nevada On-Road Vehicle Classification Study -** A*. DenBleyker, D. Jackson, M. Weatherby, S. Kishan Eastern Research Group, Inc.; K. Boriboonsomsin, University of California, Riverside; Z. Li, R. Merle, Clark County Department of Air Quality*

The Clark County Department of Air Quality (CCDAQ) sponsored a vehicle classification study to support periodic updates of emission inventories for State Implementation Plans and Maintenance Plans. The study used existing and new data collection to build input files for fleet mix and temporal VMT distribution for three vehicle emissions models MOVES, SMOKE, and CONCEPT-MV. The existing data source was hourly traffic monitor data from years 2014 to 2016, kindly provided by the Nevada Department of Transportation (NDOT). The new data collection was a 2017 license plate survey conducted by ERG’s subcontractor CE-CERT. In September 2017, CE-CERT recorded traffic on high-resolution video at five roadway sites in central Las Vegas at different times of day over a four-day period, Thursday through Sunday. CE-CERT’s data technicians later played back the video, pausing on each plate to transcribe the characters to a list. The data firm IHS Markit then matched the license plates to vehicle identification number (VIN) and provided the attributes of each vehicle. ERG then assessed the car vs. light-truck status using the VIN-decoded information, EPA definitions, and emissions certification lists. The NDOT traffic data served as the foundation for the new model input file development, while the new CE-CERT license plate survey results provided the relative car vs. light-duty truck splits by time of day by day type, which ERG mapped to all 24 hours and 7 days. The license plate survey fills an important gap in the traffic data because monitors cannot reliably distinguish cars from light-trucks.

**International Emission Inventory Conference**

**LIGHTNING ROUND ABSTRACTS**

**Chairs: Caroline Farkas and Jennifer Snyder, U.S. EPA**

2:00 – 2:05 pm – **How Collaborative was the National Emissions Collaborative? A Debrief on the Process and a Look Ahead to the Next Steps** –

*Z. Adelman, LADCO*

The National Emissions Collaborative represents a possible paradigm shift in how emissions modeling platforms (EMP) are developed in the U.S. While over 200 participants from national/state/local/tribal air agencies signed on to the Collaborative, a much smaller number of individuals actually did the work to collect, analyze, and compile the emissions data into modeling files. The Collaborative was successful because it created new precedents for transparency and participation in the EMP development process. This lightning talk will present observations from the Collaborative leadership on the strengths in the process, and where future efforts may be improved. A look ahead to the future of the National Emissions Collaborative's work on the 2016 EMP will be presented.

2:05 – 2:10 pm - **Impact of Food Waste Diversion on Landfill Gas and Leachate from Simulated Landfills -** *M. Krause and T. Tolaymat, U.S. EPA*

Food waste has long been a major component of the municipal solid waste (MSW) stream in the United States. Many states have recently established recycling goals or organics management policies that would necessitate the diversion of food waste from landfills to other management schemes such as composting or anaerobic digestion. Food wastes can be heterogenous and chemically complex, affecting landfill environments in unique ways. Food waste has also been understood to degrade relatively quickly, before landfill gas collection infrastructure can be installed, and so most food waste methane is assumed to be emitted. Five lysimeters (laboratory-scale landfills) were constructed with decreasing levels of food waste to simulate a range of scenarios that diverted 0, 25, 50, 75, and 100% food waste from the landfill-bound MSW stream. The objective was to identify the changes to rate and volume of landfill gas generation and the chemical characteristics of leachate (landfill wastewater). Landfills that diverted 100 or 75% of food waste began generating methane the fastest, contradictory to how current models predict landfill methane generation. This was found to be because food wastes contribute volatile fatty acids to MSW, that lowers pH and delays microbial methanogen dominance. Landfill leachate from landfills that diverted 100 or 75% of the food waste also had significantly decreased ammonia levels compared to the other lysimeters, which could reduce wastewater treatment costs. Landfills that prohibit food waste disposal could warrant different Clean Air Act or AP-42 inventory values.

2:10 – 2:15 pm - **Carbonaceous PM in the National Emissions Inventory** – *V. Rao, US EPA, RTP, NC*

The NEI contains estimate for PM2.5 from many sources.  PM2.5 consists of inorganics, crustal material and carbon.  Generally, carbon is the largest constituent of PM2.5 for many sources. Carbon is important both for climate and for residual PM2.5 non-attainment.  The way that carbon (both organic and elemental) is estimated in the NEI for many sources is by applying source-specific speciation profiles.  This talk will highlight that process and which sources contribute most to particulate carbon in the 2014 NEI.

2:50 – 2:55 pm - **Estimate of Lead Emissions from Wildland Fires in the U.S. –** *A. Holder, and V. Rao, U.S. EPA*

Particulate Matter (PM) from wildland fires is composed almost entirely of carbonaceous material; however, this PM may also contain many other trace elements at a minor fraction of total PM mass. Lead (Pb) is an EPA criteria pollutant that is present at very low concentrations in the environment. Some of the Pb in the soil and vegetation consumed during a fire may be emitted to the atmosphere. Because wildland fires are one of the largest sources of PM in the U.S., even trace amount of Pb in PM can lead to sizeable Pb emissions to the atmosphere. Most of the emission factors for Pb are from several decades ago when Pb was in the environment at greater levels due to the use of leaded gasoline. Additionally, improvements in analytical methods have resulted in the ability to accurately quantify lower Pb concentrations. Therefore, a series of laboratory and field burns were sampled to determine updated emission factors for Pb and other trace elements from fires. The initial results of these experiments will be summarized along with estimates of the potential impact on the estimate of Pb from fires in the EPA National Emissions Inventory. Disclaimer: *The views expressed in this abstract are those of the authors and do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency.*

**International Emission Inventory Conference**

**LIGHTNING ROUND ABSTRACTS**

**Chairs: Caroline Farkas and Jennifer Snyder, U.S. EPA**

2:55 – 3:00 pm - **Airport Inventories – What Are Our Obstacles and How Can We Overcome Them? -** *Laura Stevens New York State Department of Environmental Conservation*

The development of accurate airport emissions inventories relies upon accurate baseline data. The first step is obtaining basic airport information, such as:

* Facility name
* Identifying code(s)
* Location
* Operational status – open vs. closed.

This information may seem uncomplicated to collect, however there are oftentimes unexpected challenges. We will discuss these obstacles, along with some ways that we have found to overcome them and find accurate information to create a more robust inventory.

3:00 – 3:05 pm - **Integration of the Air Pollutant Emissions Inventory with the National Greenhouse Gas Inventory for the Transport Sector -**

*D. Smith, B. Taylor, S. Tobin, Environment and Climate Change Canada*

In Canada, historically, the federal reporting of air pollutant and greenhouse gas emissions for the transport sector was independent, as each process had developed its emissions inventories with unique activity data and models to meet different reporting requirements. An initiative to integrate the transport sector into a single platform capable of reporting air pollutants and GHGs is presented here. The first step was to harmonize vehicle fleets, fuel properties, biofuel content, kilometers travelled. After a review of modeling approaches, MOVES and a Canadian version of NONROAD were selected to create bottom up emissions for the on- and off-road sectors. Once the data flow was established, the operational capacity greatly improved as both inventories could be developed from fewer model runs. The increased efficiency allowed more resources to be dedicated to validating model inputs and continuous improvement. For example, a pilot project to improve the hours of use input parameter for the off-road sector using resale market data was implemented. One feature unique to the GHG inventory is the good practice to align emissions estimates with national energy statistics. Thus, a process was established to normalize bottom up estimates to fuel information, which was subsequently applied to air pollutants. An added benefit of the project is regulatory development using baseline and policy case scenarios are developed on a consistent basis with published inventories. The results suggest that an integrated model capable of generating emissions of both air pollutant and GHG estimates could be a successful approach for others in similar circumstances.

3:05 – 3:10 pm - **Better Permits Make Better Emissions Inventories -** *K. Kalim and W. Smith, K2 Environmental Consulting LLC*

Inventories should be as close to actual emissions as possible. But, if the underlying permits are deficient, the submitters of the annual emissions statements cannot make the proper calculations. K2 Environmental Consulting has extensive experience both in reviewing emissions statements and writing the air pollution permits. Most of the discrepancies found in the emissions statements can be traced back to missing or inaccurate data in the permits. The Lightning Talk will present examples of specific aspects of permits which should be checked for completeness and accuracy.

* Permits often account for the worst case. The emissions statement should base emissions on the average of the materials processed throughout the year.
* Methane from natural gas leaks is often counted as VOC, but Methane is an EXEMPT VOC.
* Limestone dust from material handling should have much more TSP than PM-10 and PM-2.5.
* Formaldehyde emissions are VOC, but not included in AP-42 emissions factors for VOC.
* Small natural gas heaters less than 300,000 Btu/hr have an AP-42 emissions factor of 40 lb/MMscf for CO, but a factor of 84 lb/MM scf if between 0.3 and 1.0 MMBtu/hr. Often permits group all Insignificant natural gas heaters together.
* Diesel SO2 emissions are overstated in AP-42 because sulfur in fuel oil has been drastically reduced the past 25 years.

Further examples will be covered. Small changes to air permits will lead to more accurate emissions inventories this year and for years to come.

3:10 – 3:15 pm – **Recent SMOKE Enhancements and Its Applications -** *B.H. Baek, C. Sepannen, University of North Carolina, Alison Eyth, U.S. EPA*

The U.S. EPA Office of Air Quality Planning and Standards (OAQPS) has been developing an emissions modeling platform based on the latest National Emissions Inventory (NEI) for air quality models, CMAQ, CAMx, and AERMOD. It consists of all the emissions inventories and ancillary data files used for emissions modeling. The primary emissions modeling tool used to create the air quality model-ready emissions is the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system (http://www.smoke-model.org/). The latest SMOKE version 4.6 includes many enhancements and bug fixes to support U.S. EPA’s various air quality modeling applications. It includes the following: 1) New program “Lnkmerge” to process temporally and spatially highly resolved link-level emissions that can be represented by aviation, rail and onroad sources, 2) New PostgreSQL/PostGIS Spatial Allocator Tool to generate spatial surrogates for emissions gridding processing, and 3) Various SMOKE-MOVES Enhancements; Enhancing the representation of average speed distribution to onroad emission from RatePerDistance (RPD) mode; Correcting humidity impacts on NOx emissions from RatePerVehicle (RPV) mode; and New RatePerStart (RPS) mode that can estimate vehicle start emissions based on number of vehicle starts by vehicle type.

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**LIGHTNING ROUND ABSTRACTS**

**Chairs: Caroline Farkas and Jennifer Snyder, U.S. EPA**

3:15 – 3:20 pm - **Updates to Version 4 of the Biogenic Emissions Landuse Database (BELD4) for Canada and Impacts on Biogenic VOC Emissions -** *J. Zhang and M. D. Moran, Environment and Climate Change Canada; Z. He, SOLANA Networks Inc., Canada*

Biogenic volatile organic compounds (VOCs) released from terrestrial vegetation account for 80-90% of total global VOC emissions. A detailed database of vegetation types with relatively high spatial resolution is required for accurate estimation of biogenic VOC emissions. The Biogenic Emissions Landuse Database (BELD), which covers most of North America, has been used by many regional air quality models to estimate biogenic emissions. In 2013 the U.S. EPA updated BELD from Version 3 with 230 vegetation classes to Version 4 with 286 landuse categories for the contiguous United States but retained 17 broad landuse types for Canada and Mexico based on MODIS satellite retrievals (Bash et al., 2016). A U.S.-equivalent BELD4 landuse database for Canada was subsequently compiled by Environment and Climate Change Canada (ECCC) based on the 2001 Canadian National Forest Inventory (NFI) with 109 tree species at 250-meter resolution and the 2016 Canadian Annual Crop Inventory (ACI) with 71 vegetation and other fields at 30-meter resolution (Zhang and Moran, 2018). Recently, the 2011 Canadian NFI became available, allowing the BELD4 database for Canada to be updated. In this presentation, the updated Canadian BELD4 database will be described and spatial distributions of various vegetation species within Canada from the 2001-NFI-based BELD4 and the 2011-NFI-based BELD4 databases will be compared. The impacts of the updated landuse database on biogenic VOC emissions estimated for a continental air quality modeling grid with 10-km grid spacing will also be discussed and some differences along the international border will be noted.

3:20 - 3:25 pm - **Study on Real-World Formation of Carbon Dioxide Emissions from Heavy-Duty Vehicles using Work-Based Window Method** - *Chakradhar Reddy Vardhireddy, Sai Satish Guda, West Virginia University -*

Global warming has become a major problem, air resource boards and environmental protection agencies across the world are actively working on reduction of future emissions. To account for economic forecasts of emission production rates, fuel usage and energy consumption, the estimates are based considering current emissions, technological improvements and behavioral patterns. When we talk of greenhouse gas emissions, carbon dioxide (CO2) is the pollutant that has greatest impact on the global warming, and majority of the CO2 is generated from the transport sector.

The CO2 emissions resulting from road transport vehicles accounts for 73%, and overall across the globe the CO2 emission accounts for 23% of the total emission. Due to lack of enough papers which could help in understanding the real-world data emissions production and which could assist in the development of an emission inventory, it was considered that this study would help in providing necessary information and aid air resource boards and other environmental agencies in developing new regulations.

As heavy-duty vehicles occupy a major portion of the road transport fleet and they account for the highest production of greenhouse gas emissions, it is necessary to understand their behavior during real world in-use operation while being used for different applications across various sections of the transport sector. In this study a work-based window method was employed for understanding the CO2 production behavior, also the work-based widow methods help to easily understand the vehicle behavioral parameters across entire range of engine speeds and engine loads and allows comparison of vehicles used for different applications.

3:25 – 3:30 pm - **A Comparison of Mobile Input Parameters between Two MOVES-Based National Emission Inventories of 2011 and 2014 –**

*J. -S. Lin, Virginia Department of Environmental Quality; E. Zalewsky, New York State Department of Environmental*

Conservation SMOKE-MOVES is the primary modeling tool used by EPA in the development of mobile source emissions in the National Emission Inventory (NEI) as well as regional scale modeling. Over the years, input data for SMOKE-MOVES have gone through considerable changes, in either data preparations or methodology algorithms. A wide variety of input parameters in volumetric amount involved in SMOKE-MOVES has made data examination difficult. In this study, a series of important mobile input parameters (VMT, VPOP, hoteling hours, speed profiles, temporal profiles, fleet age distributions, and emission factors) are examined and compared on a continental scale between two available MOVES-based NEIs of 2011 and 2014. Data differences in NEI versions will be highlighted and discussed in terms of their possible causes and potential impacts on air quality. By studying historical changes in NEI mobile source emission inputs, we hope to learn valuable lessons from past experiences, leading to better understanding and future improvement on mobile source inventory for use in regional air quality modeling.

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**LIGHTNING ROUND ABSTRACTS**

**Chairs: Caroline Farkas and Jennifer Snyder, U.S. EPA**

3:30 – 3:35 pm - **Simulation and Analysis of the DMS and Sulfate during the C-SOLAS SABINA Campaign –** *A. Taoussi, Jean-Pierre Blanchet, UQAM (Montreal; M. Levasseur, University of Laval (Quebec City); A.-Lise Norman, University of Calgary (Calgary)*

Oceanic Dimethyl Sulfide (DMS) is the main natural source of sulfur in the atmosphere. Sulphated aerosols derived from atmospheric DMS play an important role in cloud microphysics, precipitation, clouds, albedo and radiative balance. To achieve these objectives, a comparison was made between simulations of the North Aerosol Regional Canadian Model (NARCM) and the measurements taken during the SABINA (Study of the Air-Sea Biogeochemical Interactions in the North Atlantic) which took place in Northwest Atlantic Ocean in the spring, summer and fall of 2003. Two experiments were conducted with and without anthropogenic sources from eastern North America. The results of these simulations were compared with observations made during the SABINA cruise in order to validate the model and extend the regional analysis of North Atlantic observations. These showed that NARCM simulations for DMS and sulphate can be compared to SABINA observations only if anthropogenic and oceanic emissions are taken into account simultaneously. On the other hand, above the boundary layer, near the mainland, the emission of anthropogenic sulphate dominates whereas near Greenland, the emission of oceanic DMS dominates. Model validation and analysis of natural aerosols from DMS are essential for assessing the influence of anthropogenic sulphate aerosols on the climate

3:35 – 3:40 pm - **Real-World Elemental Carbon (EC) Emission Factors of Diesel Vehicles in China –** *X. Shen, X. Cao and Z. Yao Beijing Technology and Business University*

Elemental carbon (EC) as an important composition of PM2.5 emitted from on-road diesel vehicle is a major concern because of its impacts on climate systems. China was the largest emitter of EC due to its large population, substantial fuel consumption. The major sources of uncertainty emission inventories for EC maybe lack EC emission factors (EFEC) measurements especially in developing countries. In total, the EFEC of 112 diesel vehicles had been tested using combined on-board emission measurement system by our research group from 2010 to 2018. The light duty diesel trucks (LDDTs) EFEC from Euro 0 to Euro V were 0.28±0.11g/km, 0.15±0.13g/km, 0.09±0.07g/km, 0.02±0.01g/km, 0.04±0.01g/km and 0.02±0.03mg/km; The middle duty diesel trucks (MDDTs) EFEC from Euro 0 to Euro IV were 0.32±0.25g/km, 0.30±0.18g/km, 0.03±0.02g/km, 0.02±0.01g/km and 0.01±0.004g/km; The heavy duty diesel trucks (HDDTs) EFEC from Euro 0 to Euro V were 0.66±0.03g/km, 0.48±0.05g/km, 0.13±0.10g/km,0.09±0.05g/km, 0.10±0.08 and 0.01±0.009g/km; The EFEC for 3-W and 4-W RVs were 0.058 ± 0.055 g/km and 0.031 ± 0.024 g/km, respectively; The EFEC for 3-W rural vehicles (RVs) varied more widely than for 4-W RVs. The EFEC were significantly reduced under more stringent mission standards. The fraction of EC/PM2.5 ranged from 35% to 70% for diesel vehicles. The distance-based average EFEC of diesel vehicles were affected by vehicle size, driving conditions and emission standards. The engine condition of the 3-W RVs is worse than 4-W RVs, and worse than Euro III LDDTs.

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**POSTER SESSION ABSTRACTS**

**(\* Indicates Student Presentation)**

1. **A Spatio-temporal Approach to Improve the Carbon Stock Estimates of Woody Biomass in Croplands in Canada -** *A. Thiagarajan, Environment and Climate Change Canada; J. Liu, D. MacDonald Agriculture and AgriFood Canada*

Croplands in Canada contain perennial woody biomass serving several functions and representing significant stocks of carbon (33-41 Tg). This carbon can be lost to the atmosphere or augmented depending on trends in the agricultural industry. Estimating carbon loss and gain in these woody species is challenging due to their transient states as land management changes and the trees and shrubs themselves grow. Currently, these changes are estimated employing an extrapolation technique derived from a paired-image analysis, which is used to scale the fluxes up to full cropland surface. These aerial images consisted of two temporal datasets (*circa*-1990 and 2000) from 230 sample sites, stratified by 12 distinctive agro-climatic zones (Huffman et al. 2015). This methodology is constrained by the lack of availability of coverage of temporally replicated high-resolution images. The proposed analysis expands on the previous work of Huffman et al. (2015) by adding an additional temporal dataset (*circa*-2010). Further, a geo-statistical investigation is conducted to increase our understanding on how ecological features and agricultural industry statistics such as; farm type, average farm size, types of crops grown, frequency of potholes, terrain features, proximity to forestland, among others, impact the stock and flux of carbon stored in woody species. Through spatiotemporal or correlation analyses between the agro-ecological features and the woody biomass changes, key explanatory variables associated with woody biomass losses in croplands are identified. These variables will be used to strengthen and improve our methodology used in the woody biomass estimations.

1. **Agricultural Production, distribution and the demands for pesticides in Nigeria. -** *M.A. OKE, Department of Agricultural and International Development of Michael Adedotun Oke Foundation, Nigeria*

The demands for all form of agricultural inputs such as the seeds, fertilizers, pesticides all over the world are increasing, but there must be guided agricultural policies related to the usage, supply, emissions, regulation and policy frame work so that it can benefit the farmers, agricultural players at large.

This paper focus on the needs to explore the use of the pesticides in preservation, storage systems for Onions and Bambara nut, because here in Nigeria there was a bumper harvest of onion, which was recorded in Sokoto and this year Bambara was translated into a great income and booms for the farmers. The use of the different agrochemicals is based on the individual’s purposes in storage, emissions, preservation, although the usage must be guided with principles, economically factors, safety of production, distribution systems, food quality and security, understanding the agronomical principles, social factors towards sustainable agricultural systems. Here in Nigeria the different Bambara nuts is stored either in special coated sacks or pesticide treated normal sacks. Some weevils, like those that destroy beans, also attack Bambara nuts. To store effectively, someone have to be careful so that the seeds will not damage, which is seasonally. Many people are engaged in the local processing of Bambara nuts. Girls is involved in the processing, distribution and selling of the crops, it is traded in almost every weekly market in the North. Meanwhile the onion farmers in Nigeria and dealers have made passionate appeals for provision of Morden storage facilities and more support from government in the form of soft loans and others such as fertilizer’s, pumping machines and pesticides.

1. **Improvements to the National Emission Inventory: Crop Residue Burning and Rangeland Burning –** *G. Pouliot, J. Vukovich, V. Rao, U.S. EPA*

Biomass burning from grasslands, rangelands, and crop residue is an important contributor to the degradation of air quality because of its impact on ozone and particulate matter. We will summarize improvements to the 2017 National Emission Inventory (NEI) for grasslands, rangelands, and crop residue emission sources. In addition, some of these improvements will be incorporated into the 2016 modeling platform currently being developed by EPA and the states. For the 2017 NEI, prescribed burning in the tall grass prairies of the Kansas Flint Hills region (which extends into Oklahoma) will have a unique source classification code and the area burned will be based on a collaboration with the Kansas Department of Health & Environment. In addition, for the 2017 NEI, emission factors for hazardous air pollutants (HAPs) will be harmonized with volatile organic compound (VOC) speciation to ensure that the criteria air pollutants (CAP) and HAP emission inventories provide a consistent estimate of all VOCs. A new VOC profile for sugarcane burning has also been incorporated into the inventory development process. Finally, we will use state specific information to improve the classification of fires within the fire inventory.

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**4. \*The Impact of Regional Agricultural Emissions on Urban Aerosol Chemistry in the Eastern U.S. –** *N. Balasus, R. Delgado, M. Battaglia Jr, and*

*C. J. Hennigan, University of Maryland*

The abundance and chemical composition of particle and gas-phase constituents in the Baltimore area are strongly impacted by its close proximity to regional agricultural sources. As part of the second Ozone Water Land Environmental Transition Study, the OWLETS-2 field campaign, in the summer of 2018, measurements of PM2.5 inorganic aerosols and gas-phase ammonia concentrations were carried out at Hart Miller Island, a site near the land-water transition in Baltimore. Meteorological data were collected along with the highly time-resolved chemical measurements to characterize the connection between the bay breeze, different emission sources, and chemical processes occurring in the Baltimore urban airshed. High aerosol nitrate concentrations were frequently observed throughout the study, an unusual occurrence for summertime in the eastern United States. Elevated gas-phase ammonium concentrations corresponded to the high nitrate concentrations. Ammonia demonstrated a very distinct diurnal profile, with a strong increase from sunrise to a mid-afternoon peak. Pollutant sources were investigated by utilizing NOAA’s HYSPLIT back trajectories and as well as analysis of wind speed and direction from an on-site wind lidar. Winds were predominantly from the south and the east – differences in pollutant concentrations were compared in these different regimes. Low-speed eastern winds corresponded with the highest particulate ammonium and nitrate concentrations. Back trajectory analyses suggest the elevated ammonia concentrations originate from agricultural sources in the region, with strong influences on aerosol chemistry and acidity. Differences were identified when the predominant influence was the poultry-producing region of southern Delaware/eastern Maryland compared to the dairy-producing region of southeastern Pennsylvania

**5. A Generic Framework to Estimate Greenhouse Gases Emissions from Land Use Changes in Canada –** *L. Lapointe-Elmrabti, A. Thiagarajan and*

*J. D. MacDonald, Environment and Climate Change Canada*

The Land Use, Land-use Change, and Forestry (LULUCF) Sector reports anthropogenic GHG fluxes between the atmosphere and Canada’s managed lands. The assessment includes emissions and removals of carbon dioxide (CO2) including residual emissions from past land-use change as well as emissions of methane (CH4) and nitrous oxide (N2O) from forest, wetlands, settlements and agricultural lands. Land use change results in carbon emissions, removals and transfers that are transitional in nature and require clear application of the rules established by the Intergovernmental Panel on Climate Change (IPCC) for reporting. Currently, emissions are estimated using various platforms (i.e. Excel, Access, SQL), which need to be reconciled afterwards. We have developed a script in the programming language R that applies a generic approach to land-use change that is fully compatible with IPCC guidelines. The script uses a standard treatment of land-use change activity data and uses a transition matrix approach to apply stepwise annual carbon transfers between pools. Finally, the script incorporates a number of generic IPCC Tier 1 and 2 methods and project specific decay equations to quantify immediate and residual emissions from the soil carbon pool. The generic framework will (i) ensure transparent and consistent implementation of IPCC protocols (Tier I and II), (ii) separate preprocessing and estimation steps, simplifying data management, (iii) and facilitate development of estimates for existing inventory sources.

**6. EPA's Emissions & Generation Resource Integrated Database (eGRID): Addition of PM Emissions Rates –** *J. Dorn and D. Cooley, Abt Associates,*

*T. Johnson, U.S. EPA*

Electricity generation is the dominant industrial source of air pollutant emissions in the United States today. Whenever you switch on an electrical appliance, chances are you are contributing to air pollution and greenhouse gas emissions. By documenting the environmental attributes of electric power generation, the Emissions & Generation Resource Integrated Database (eGRID) can help consumers, policy analysts and researchers to better understand the relationship between electricity and the environment. eGRID integrates many different federal data sources on power plants and power companies, including, but not limited to data sources from: EPA, the Energy Information Administration (EIA), and the North American Electric Reliability Corporation (NERC). Emissions data from EPA are carefully integrated with generation data from EIA to produce emission rates in pounds per megawatt-hour (lb/MWh), which allows direct comparison of the environmental attributes of electricity generation. eGRID provides a convenient source of data for states implementing policies such as emissions disclosure, output-based emissions standards, and renewable portfolio standards. Historically, eGRID has included emission rates for SO2, NOx, CO2, CH4, and N2O. An improvement planned for eGRID2018 is the addition of PM emission rates.

**7. Reducing Uncertainty in Air Pollution Emissions Inventory of India –** *A. Datta, R. Suresh, H. Rahman, A. Goel, I. Khanna, V. P. Sharma, P. Sharma, and S. Sharma, The Energy and Resources Institute India Habitat Center, New Delhi*

At the juncture of rapid economic growth in India, it is critical to delink growth trends from its impacts on the environment and human health. It is essential to have high-resolution, robust emission inventories for effective control of ambient air pollution vis-à-vis addressing the delink. A study was undertaken to reduce uncertainties in emissions inventory of air pollutants like particulate matter (PM10 and PM2.5), Sulphur dioxide, oxides of nitrogen, carbon monoxide, ammonia (NH3) and Non-methane volatile organic compounds. Sector specific annual emissions inventory was developed (resolution: 36km × 36km) across the country for power (including diesel generator), industries, transport, residential, open burning of refuse and crop residues, agriculture and other small sectors like restaurants, construction etc. for the year 2016. Region specific emission factors were developed for open burning of crop residues (~60 samples) and refuse materials (~40 samples) using the state-of-the-art methodology involving controlled combustion chamber. Indigenous emission factors have also been developed for small scale industries like dyeing, ceramics, sponge iron etc. by monitoring of stack emissions in several industrial zones across the country. The regional diversity of road dust emissions is also captured through analysis of ~400 samples from different roads across the country. An indigenous emission factor for NH3 emissions from agriculture sector was adopted through meta-analysis of available literature. The activity data of different sectors for the year were prepared based on secondary data from peer sources. Results suggest that the residential and industrial sectors are major sources at regional scale; however, transport is prominent source in cities. The study will help to develop regional-scale environmentally sustainable policies.

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**8. A Preliminary Assessment of the First Iranian National Emission Inventory (INEI) for 8 Large Cities: Role and Importance of Mobile Sources –** *O. Ghaffarpasand, University of Isfahan, Isfahan, Iran; , H. Ghiasinejad, Iranian University for Science and Technology, Tehran, Iran; M. Habibian, University of Technology, Tehran, Iran; Y. Hojjat, Tarbiat Modares University, Tehran, Iran; V. Hosseini, Sharif University of Technology, Tehran, Iran; A. Karimi-Jashni, Shiraz University, Shiraz, Iran; L. Khazini, University of Tabriz, Tabriz, Iran; M. Naseri; University of Tehran, Tehran, Iran; A. Ohadi, Amirkabir University of Technology, Tehran, Iran; , Y. Rashidi, Environmental Sciences Research Institute; S. Behehshti University, Tehran, Iran; M. Taleai, Faculty of Geomatics; K.N.Toosi University of Technology, Tehran, Iran*.

Air pollution in Iranian large cities is the cause of serious health issues for the population over the past decades. The annual average PM2.5 concentration is 32 μg/m3 in 2018, which is more than 3 times larger than the national health limits. It causes more than 4500 mortalities and an estimated 2.6 billion USD/year in economic cost in Tehran. Iranian Department of Environment (DoE) has funded a national-scale project to develop the first unified and systematic emission inventory system. The base year of the study is 2018 and it covers 8 largest cities of the nation that inhabit more than 35% of the nation population. The cities include Tehran, Karaj, Mashhad, Isfahan, Tabriz, Arak, Shiraz, and Ahvaz.

The national emission inventory system included mobile sources with detailed local emission factors, activity data, and detailed fleet composition. It also includes stationary sources such as airports, bus and train terminals, fueling stations, industries, house heating, and power generations. The inventory is operated under a mathematical model with time resolution of 1-hour and geographical resolution of 500 m. Preliminary results show large contribution of mobile sources in most cities. For cities of Tehran, Isfahan, Tabriz, Shiraz, and Karaj the contribution of mobiles sources is high and almost all of CO, and more than half of NOx and PM are emitted from mobile sources. As examples, more than 95% of gaseous emissions comes from mobile sources in the city of Tabriz. In Tehran, 43% of direct PM emissions comes from the diesel truck fleet. In Isfahan, diesel trucks are the main contributors to NOx emissions. The picture is different in a few cities. In Mashhad, the largest contribution to PM and NOx comes from power generation. In contrast, for cities of Arak and Ahvaz, 70% of SOx emissions are from industrial sources. City of Ahvaz which was ranked as one of the most polluted cities of the world is a special case in which natural transboundary dust from dried wetlands are one of the main sources of air pollution, especially during winter. Emission inventory studies are yet to be completed by a national PM2.5 source apportionment study, while it is quite clear for the nation that dealing with mobiles sources in most cases is the first priority

**9. BOEM’s 2017 Emission Inventory and Trends Analysis for the Gulf of Mexico Outer Continental Shelf –** *B. Do, D. Wilson, S. Enoch, H. Perez,*

*R. Chang, J. Sellers, and R. Billings, Eastern Research Group; H. Ensz, Bureau of Ocean Energy Management*

The Bureau of Ocean Energy Management (BOEM) is responsible for assessing the potential impacts of air emissions from offshore oil and gas exploration, development, and production sources on the Outer Continental Shelf (OCS). The OCS Lands Act (1334(a)(8)) tasks BOEM to assure that emissions from these activities do not significantly affect the air quality of any state. The BOEM Gulf of Mexico (GOM) Region is responsible for determining if OCS oil and gas exploration, development, and production sources significantly influence the air quality in Louisiana, Texas, Mississippi, Alabama, and Florida.

BOEM is currently completing the Year 2017 Emissions Inventory Study for criteria pollutants, criteria pollutant precursors, greenhouse gases, and select HAPs. The inventory covers all OCS oil and gas production platforms in the GOM OCS, non-platform production-related sources (e.g., drilling rigs, support vessels and helicopters, survey and pipelaying vessels), as well as other sources in the GOM such as commercial marine vessels, fishing vessels, and biogenic and geogenic sources. Significant enhancements that have been made to in the 2017 inventory will be presented, including development of helicopter estimates based on FAA NextGen data, spatial quantification of oil seeps from geogenic sources using satellite data, and use of AIS data to map commercial and recreational fishing activities. Highlights of the Emissions Trends Analysis for oil and gas production-related sources will also be presented.

**10. Comparing Onroad Age Distributions Derived from Remote Sensing Studies to Registration-Based Age Distributions for Light-Duty Vehicles Used in the NEI -** *C. Toro, D. Sonntag, M. Beardsley, C. Fulper and S. Roberts, A. Eyth and L. Driver, U.S. EPA*

Onroad mobile source emissions in the National Emissions Inventory (NEI) are estimated using the MOVES model using activity data from States and other sources. Previous EPA work has shown that the light-duty emissions modeled in MOVES are sensitive to the age distribution input. Currently, the NEI derives age distributions from vehicle registration data obtained from a commercial source. However, it is not known how the age distributions based on registration data differ from the age distribution of vehicles that are on the road. Here, we explore the age distributions derived from remote sensing studies with the age distributions used in the NEI. We focus on understanding differences between age distributions based on these two types of data and assess the potential applicability and limitations of this approach.

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**11. Enhanced Modelling Approach for Quantifying Fugitive Emissions from Canada’s Upstream Oil and Gas Industry -** *A. Osman and S. Smyth, Environment and Climate Change Canada*

The current methodology used to estimate fugitive carbon dioxide and methane emissions from upstream oil and gas (UOG) operations in Canada’s National Inventory Report relies on detailed bottom-up emission estimates for the years 2000, 2005 and 2011. For all other years, the emission estimates are interpolated/extrapolated, based on annual production data. This approach does not provide the flexibility to incorporate improvements from new scientific findings, to track the impact of regulations or of changes in practices and technology. A more flexible modelling approach is being developed to estimate emissions from the following fugitive sources: pneumatic devices, reciprocating compressors and unintentional leakage from other equipment. The first step in this approach involved developing an inventory of UOG facilities (e.g. wells, batteries, compressor stations). Next, an inventory of fugitive equipment sources present at these facilities was developed using the facility counts and equipment asset ratios per facility type. Emissions are then estimated using emission factors and gas speciation factors. This detailed modelling approach estimates emissions for each year of the time series (i.e.1990-2017) and allows for specific emission source estimates (e.g. methane emissions from pressure pneumatic controllers at light/medium crude oil single well batteries in Alberta). This approach also allows the ability to reflect updated understandings of the oil and gas sector in the emission estimates. The model estimates emissions from oil and gas producing regions in Canada (i.e. Alberta, British Columbia, Saskatchewan, and Manitoba). The modelling approach is outlined, and the model is described, along with preliminary results and comparisons.

**12. Psemplot Emissions Visualizer -** *J. Beidler General Dynamics Information Technology*

Emissions processing and inventory analysis requires spatial review for quality assurance. Psemplot is a python-based scriptable tool to quickly visualize both inventory-level and gridded emissions data. The tool can rapidly generate county, state, and gridded thematic maps over many modeling domains and projections. This system can either be run with scales and maps autoconfigured or with command line options to customize the output. Variable values within the same file can be combined and mathematically manipulated using simple command-line statements. Psemplot has produced thematic maps and visualized emissions data for use in quality assurance products, inventory review, technical support documents, and presentations. This poster provides example implementations of psemplot and output products.

**13. Recent Improvements to SMOKE Temporal Profile and Spatial Surrogate Files for Canada –** *Q. Zheng, J. Zhang, T. Gui, M. Moran, M. Samaali, D. Rioux, P. Martin, Environment and Climate Change Canada*

The exact temporal and spatial allocation of emissions from area, on-road, and off-road sources are often unknown. To address this gap, the temporal and geographic distributions of these various source types are typically approximated using temporal profiles and spatial surrogate fields that are assumed to be representative of the distribution of these emissions in time and space. Canadian inventories usually report annual sector-specific emissions at the provincial or territorial level. It is thus always a challenge to process these inventories into the resolution and formats needed by air quality models. Recently, we have made some updates to the libraries of temporal profiles and spatial surrogates used by the Sparse Matrix Operator Kernel Emissions (SMOKE) emissions processing system for the temporal and spatial allocation of Canadian emissions. As an extra step in our recent conversion of the existing Canadian temporal profile library to the new temporal file format used by the newest versions of SMOKE, we have also removed the default monthly, weekly, and daily temporal profiles but added more specific cross-references to the temporal cross-reference file to compensate. We also checked the temporal profiles used for each of the top 20 emitters for each criteria air contaminant in the 2015 Canadian emissions inventory, and as a result we have updated the monthly and weekly profile assignments for some off-road and area sources. As well we have added several new monthly temporal profiles for some agricultural sectors based on activity statistics. 2016 census population and dwelling data are available now from Statistics Canada. These new census data sets have been used to develop new population and dwelling spatial surrogates. The spatial surrogates for some off-road mobile sources have also been updated, including railways, railyards, aircraft landing and takeoffs, airport ground operations, and marine pleasure craft. More details for these updates will be provided in this presentation.

**14. \*Towards Refining Estimates of Ammonia Emissions: Modeling Framework Preparations –** *M. Momeni and S. L. Capps, Drexel University;*

*M. Lombardo, Johns Hopkins University; S. Zhao and A. Hakami, Carleton University; S. Thomas, J. Silver, and P. Rayner, University of Melbourne, Australia; D. Henze, University of Colorado,*

Ammonia (NH3) plays a significant role in forming fine inorganic particulate matter (PM2.5) in the atmosphere, which is associated with premature mortality. Uncertainty in ammonia emissions is propagated into secondary PM2.5 concentrations simulated by a model, which are used to estimate health effects. We are preparing to calculate revised estimates of NH3 emissions with a combination of observations from the Cross-track Infrared Sensor (CrIS) satellite-based instrument and the Community Multiscale Air Quality (CMAQ) model with its adjoint. We first tested the validity of the adjoint-based sensitivities of concentrations with respect to emissions by comparing them to sensitivities calculated with the forward model using the finite difference method. Once confirmed, inorganic PM2.5 and ammonia were simulated over the U.S. using CMAQ. We developed a CrIS observation operator to calculate the cost function, which is the discrepancy between the CrIS retrieval over the real world and what CrIS would have seen had it flown over the CMAQ atmosphere, and the gradient of it with respect to ammonia concentrations. Then, the influences of emissions on the cost function were determined by using the CMAQ adjoint. These spatially-specific sensitivities are evaluated in different regions over the U.S. Finally, the CMAQ adjoint was integrated in a Python-based four-dimensional variational framework for future refinement of ammonia emissions over the U.S.

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**15. U.S. EPA Greenhouse Gas Data on Petroleum and Natural Gas Systems** **–** *A. Eisele, U.S. EPA*

Abstract unavailable at this time.

**16. \*Assessing the Impacts of Emissions from Oil and Gas Extraction on Urban Ozone and Associated Health Risks –** *C. Lyu and S. L. Capps, Drexel University; R. Nsanzineza, D. K. Henze and J. B. Milford, University of Colorado; A. Hakami and S. Zhao, Carleton University*,

Natural gas and oil exploration and production processes emit gases that contribute to tropospheric ozone formation, which negatively impacts human health and public welfare. Attaining the ozone National Ambient Air Quality Standard (NAAQS) has been challenging for some urban regions, including certain cities adjacent to oil and gas development. For these locations, understanding the relative contribution of emissions from oil and gas activities is important to evaluating emissions control strategies. In this investigation, we elucidate the influences of oxides of nitrogen (NOx) and volatile organic compound (VOC) emissions on these urban areas and estimate the contribution of recent oil and natural gas activities to ozone exceedances and ozone-related premature mortality.

Specifically, we use the adjoint of CMAQ to calculate the sensitivity of urban ozone concentrations and NAAQS exceedances and of ozone-related health risks to emissions of precursor gases. The adjoint efficiently determines these relationships for each emitted species. We contrast the relative influences of VOCs and NOx on ozone in urban centers in the Colorado Front Range, the Northeastern corridor, and eastern Texas, which have experienced recent acceleration of development of oil and natural gas resources nearby, with those in the southern California area, which has managed adjacent oil and gas production for a longer period of time.

**17. Use of National Emissions Inventory Data for Development of Regulatory Reporting Requirements in Canada -** *A. Monette,*

*Environment and Climate Change Canada*

The National Pollutant Release Inventory is Canada’s inventory of facility-reported releases of over 300 substances. The NPRI is similar in many respects to the United States’ Toxics Release Inventory. Facilities in Canada that meet certain requirements are required to report data on quantities of substances released (to air, water and land), disposed of and recycled to Environment and Climate Change Canada (ECCC). These substances include criteria air contaminants, hazardous air pollutants and persistent, bio accumulative and toxic substances.

The criteria to determine whether a facility is required to report releases to the NPRI are developed through a public consultation process, supported by analyses performed by ECCC. Since Canada does not have a nation-wide, process-level inventory of air emissions from facilities, United States National Emissions Inventory (NEI) data are often used to evaluate potential changes to the Canadian reporting criteria. Analyses of 2014 NEI data are currently being used to propose reporting requirements for seven criteria air contaminants and 65 volatile organic compounds. The proposed changes include requiring more emissions to be allocated to individual stacks and requiring combustion- and process-related emissions to be reported separately.

NPRI data form the basis of Canada’s comprehensive air emissions inventories, including the Air Pollutant Emission Inventory and the Black Carbon Inventory, which then serve as inputs to air quality models. The proposed changes to NPRI reporting requirements are intended to provide more data for use by compilers of comprehensive air emissions inventories and air quality modelers.

**18. Emission Factor Review of Condensible Particulate Matter (CPM) from Stationary Sources -***J. Mangino, U.S. EPA*

The condensable component of particulate matter is released as a gas but upon dilution and cooling it forms particles shortly after the release. In current emission reporting, there is much uncertainty on whether test methods capture CPM or not, and how good the CPM emission factors are. Across different source sectors, different PM measurement techniques are being used, and consequently the emission factors that result can include or exclude the condensable component. To look at this issue more closely, state and local agency-reported CPM emission factors are. Across different source sectors, different PM measurement techniques are being used, and consequently the emission factors that result can include or exclude the condensable component. To look at this issue more closely, state and local agency-reported CPM emission factors and data from EPA’s Emissions Inventory System (EIS), EPA’s WebFIRE emission factor database, EPA’s PM Augmentation tool, and other sources of CPM emission factor/testing data, were collected and analyzed. Various statistical summaries, data characterizations, and graphical presentations are used to summarize and document the results of the CPM emission factor data review for CPM from point sources. Key findings from the emission factor review are presented, including key source category analysis, characterization of the variance in reported emissions factors from similar sources, characterization of the basis for emission factors, identification of important source types with limited emission factor data, and recommendations for further studies and emissions measurement activities.

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**19. Canada’s Inventory of Facility-Reported Pollutant Releases: the National Pollutant Release Inventory –** *J. Underhill, Environment and Climate Change Canada*

The National Pollutant Release Inventory (NPRI) is Canada’s public inventory of facility-reported releases, disposals and transfers. It is a key resource for identifying and monitoring sources of pollution in Canada. The NPRI tracks over 320 pollutants from over 7,000 facilities across Canada including mines, oil and gas operations, utilities, sewage treatment plants and other sectors.

All of the data the NPRI collects are publicly available on the NPRI website and the Government of Canada’s Open Data Portal. This poster presentation will include a live demonstration of how to access NPRI data products, including:

* Online query tool to search detailed information on pollutant releases;
* Single year tabular data including the most commonly used data fields;
* Bulk data from 1993-2017 in normalized format for pivot table analyses; and
* Map layers – Virtual Globe (including Google Earth™) and Open Mapping services files.

NPRI data have many uses, including improving public understanding about sources of pollution in Canada, encouraging voluntary action to reduce releases and tracking progress in reducing releases. NPRI data also form the basis of Canada’s comprehensive air emissions inventories, including Canada’s Air Pollutant Emission Inventory and Black Carbon Inventory, which serve as inputs to air quality models and support international reporting obligations.

**20. What’s New with EPA’s Risk and Technology Review (RTR) Program –** *E. Goehl, U.S. EPA; D. Wilson and S. Enoch, Eastern Research Group, Inc*.

The EPA’s Risk and Technology Review (RTR) Program is a combined effort to conduct technology reviews and residual risk assessments under Clean Air Act (CAA) Sections 112(d)(6) and 112(f), respectively. Section 112(f)(2) requires the EPA to conduct risk assessments on these source categories to determine if additional health-based standards are necessary to reduce the residual risk.

In the last three years, these RTR risk assessment modeling files (modeling files) were prepared for approximately 20 source categories, and modeling files for an additional 20 source categories are planned or are already in progress.

Due to tighter schedules and reduced funding, the EPA is relying on readily available inventory data (e.g., NEI) rather than information collection requests from industry to model potential health risks. To facilitate modeling file development, the EPA created a new report in the EIS Gateway called the “SPPD RTR Modeling File Data Retrieval.” The quality assurance (QA) review of these modeling files has become more automated in recent years. The EPA uses a Microsoft Access-based tool to automate QA checks and ArcGIS Online maps to review location information.

The modeling file QA process often results in identifying potential emission outliers and results in corrections to NEI emissions values in modeling files. As risk analyses are updated for use in rulemakings, it is important to make sure emissions values are accurate.

The purpose of this poster presentation is to show these new tools and illustrate the importance

of input data on risk results.

**21**. **Introduction to Canada’s Emissions Inventories –** *D. Smith, B. Taylor, J. Underhill, A. Monette, Environment and Climate Change Canada*

This presentation will provide an overview of Canada’s national air emissions inventories and how they are connected:

* National Pollutant Release Inventory: Canada’s inventory of facility-reported releases of over 300 substances, including criteria air contaminants, hazardous air pollutants and persistent, bio accumulative and toxic substances. The program has collected data from facilities every year since 1993.
* Air Pollutant Emissions Inventory: a comprehensive inventory of emissions of 17 air pollutants at the national and provincial/territorial levels, published annually since 1973.
* Greenhouse Gas Reporting Program: information on greenhouse gas emissions reported by facilities across Canada. The program has collected data from facilities every year since 2004.
* Canada’s Official Greenhouse Gas Inventory: an annual inventory of anthropogenic emissions by sources and removals by sinks at the national and provincial/territorial levels dating back to 1990.
* Black Carbon Inventory: an annual inventory of black carbon emissions that was first published in 2016 with data from 2014 onwards.

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**22. \*Study on Real-World Formation of Carbon Dioxide Emissions from Heavy-Duty Vehicles Using Work-Based Window Method** –

*C. R. Vardhireddy, S. S. Guda, West Virginia University*

Global warming has become a major problem, air resource boards and environmental protection agencies across the world are actively working on reduction of future emissions. To account for economic forecasts of emission production rates, fuel usage and energy consumption, the estimates are based considering current emissions, technological improvements and behavioral patterns. When we talk of greenhouse gas emissions, carbon dioxide (CO2) is the pollutant that has greatest impact on the global warming, and majority of the CO2 is generated from the transport sector.

The CO2 emissions resulting from road transport vehicles accounts for 73%, and overall across the globe the CO2 emission accounts for 23% of the total emission. Due to lack of enough papers which could help in understanding the real-world data emissions production and which could assist in the development of an emission inventory, it was considered that this study would help in providing necessary information and aid air resource boards and other environmental agencies in developing new regulations.

As heavy-duty vehicles occupy a major portion of the road transport fleet and they account for the highest production of greenhouse gas emissions, it is necessary to understand their behavior during real world in-use operation while being used for different applications across various sections of the transport sector. In this study a work-based window method was employed for understanding the CO2 production behavior, also the work-based widow methods help to easily understand the vehicle behavioral parameters across entire range of engine speeds and engine loads and allows comparison of vehicles used for different applications

**23. Extending Air Monitoring: Simultaneous Analysis of Ozone Precursors, Air Toxics and Carbonyls –** *R.Li, N. Watson and J. P. Mayser, Markes International*

Many of the Volatile Organic Compounds (VOCs) in ambient air have impacts on human health, air quality and climate change. To better understand their impacts, obtaining accurate VOC speciation profiles in the emission inventory is crucial. Among most VOC sources, the top concentration VOCs include light hydrocarbons (e.g. ethane, ethene, propene et al.), formaldehydes (and other carbonyls) and toxic species (e.g. halogenated hydrocarbons and aromatics). This study describes the sampling and analysis of a combined list of PAMS ozone precursors, TO-15 air toxics and carbonyls at high humidity in a single run, without the use of liquid nitrogen or other cryogen. The setup includes a cryogen-free pre-concentrator and a water management device coupled to a dual-column/Deans switch, which are connected to FID and quadruple MS detector respectively. Experiments using online and canister sampling method were carried out to evaluate the performance of this system. It is demonstrated to produce data that satisfies the performance criteria for related standard methods, for very volatile C2 hydrocarbons, oxygenated polar VOCs such as acrolein and formaldehyde, and the less volatile air toxics such as naphthalene, even at 100% relative humidity.

**24.** **An Analysis of Paved Road Dust Profiles in EPA’s SPECIATE Database –** *H. Hu and M. Gumpertz North Carolina State University; M. Strum and V. Rao, U.S. EPA*

One of the major sources contributing ot ambient particulate matter (PM) is road dust. Paved road dust and unpaved road dust are both important emission contributors to PM in the ambient air. This study summarizes the chemical composition of PM2.5 particulate matter in paved road dust from the speciation profiles in the US Environmental Protection Agency’s SPECIATE database. This study compiled the percentages, by weight, of the chemical species in 103 paved road dust profiles sampled between 1987 and 2007. The major species include elemental carbon, chloride ion/chlorine atom, nitrate, organic carbon, sulfate, selenium, titanium, silicon, iron, and calcium. The species percentages were averaged by state, by climate region and by year tested. The number of profiles ranged from 1 each in Alabama and Alaska to 55 in California. Organic carbon was the largest component of road dust, followed by elemental carbon in most states. This study explores the variation of the profiles by geographically and by year tested. The results from this work will help better inform whether EPA needs to use revised paved road dust profiles to conduct regional air quality modeling in the US.

**25**. **CANCELLED**

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**26. How the Integration of Farm Management Information Changes Our Understanding of Greenhouse Gas Emissions from the Livestock Industry –** *C. Flemming, J. Douglas MacDonald, Environment and Climate Change Canada; C. Liang, A. Vanderzaag, D. Worth,*

*R. Desjardins, Agriculture and AgriFood Canada*

Canada prepares Canada’s national inventory of agricultural greenhouse gas emissions (GHG) from livestock production. Until recently, livestock emission models for dairy and swine used fixed parameters from expert opinion surveys and default IPCC parameters. To better capture the intensification of management in these industries over time, new country-specific time series information was added to the models to better track where and when emissions occur during the livestock production process. Specifically, improved information was developed about animal nutrition and manure management practices, and further, a more robust tracking system for nitrogen transfers and losses to the environment was implemented. Improved detail in emission models did not have large impacts on total emissions, changing total emissions by less than 2%. What was notable in the revised estimates were changes to the trends and emission profiles of the industries. For example, in the case of the dairy sector, the increased use of liquid manure systems increased the CH4 emission factor by 100%, and the N2O emission factor decreased by 27%. Total N loss decreased by over 50% during storage and on application to agricultural fields; However, a greater amount of N was applied to crops, increasing direct soil N2O emissions by 40 to 80%. Results demonstrate the importance of accurate system descriptions for livestock models, such that the information produced by models accurately informs policy-makers and the public of the links between management decisions and emission sources; and as such, how to more effectively inform mitigation action against emissions.

**27.** **ECHO Clean Air Tracking Tool (ECATT)** - *M. Barrette, R. Kane, and J. Yourish, U.S. EPA*

The ECHO Clean Air Tracking Tool (ECATT) is a tool that makes it easy to use air monitoring stations to find pollutant and cancer-risk hotspots and analyze related data to identify potential contributors. It is a one-stop shop for Clean Air Act data that can be used for air quality analysis. ECATT includes emissions data from the Toxics Release Inventory (TRI), Greenhouse Gas Reporting Program (GHGRP), Emissions Inventory System (EIS), and Clean Air Markets Division (CAMD) programs, as well as evaluation and compliance data, facility classifications, air monitoring station data, and toxic risk data. The tool has the functionality to help identify facilities that may be under-permitted based on reported emissions by cross-referencing that data with permit information from ICIS-AIR. ECATT includes two key reports – the Air Pollutant Report, which displays emissions data and trends at a facility level; and the Air Monitoring Station Report, which allows users to investigate readings of Hazardous Air Pollutants at air monitors, rank nearby point sources based on their emissions, and use meteorological information to help analyze which facilities may be contributing to high readings. Version 1 of ECATT was launched in June 2017 and piloted with states and Regions. Based on feedback, Version 2, slated for release in Spring 2019, will offer several new features, including an improved mapping component which will allow ranking monitors by pollutant readings, cancer risk, or hazard quotient, and more up-to-date data. ECATT (ECHO Gov Login Required) https://echo.epa.gov/trends/air-monitoring-stations

**28.** **Impact of Using Different Emissions on Canadian Air Quality Forecasts –** *R. Mashayekhi, R. Pavlovic, M. Sassi, J. Racine, P. M. Manseau1, J. Zhang, Q. Zheng and M. D. Moran, Environment and Climate Change Canada*

The Regional Air Quality Deterministic Prediction System (RAQDPS) is a Canadian Air Quality System, which has been run operationally by Canadian Meteorology Center (CMC) of Environment and Climate Change Canada (ECCC) since 2001. The current air quality core of RAQDPS is GEM-MACH (Global Environmental Multi-scale Modeling Air Quality and CHemistry). This model is a coupled system of an on-line chemical transport model and the multi-scale operational weather forecast model of ECCC.

The current version of RAQDPS is run twice daily to produce 48-hour forecasts of ozone (O3), nitrogen dioxide (NO2) and fine particulate matter (PM2.5) on a 10-km domain covering North America. RAQDPS forecasts are used as guidance by operational AQ forecasters at ECCC and elsewhere and are also made available to the public through ECCC’s public-domain weather website (see http://www.weather.gc.ca/aqfm/index\_e.html).

Preparation of a set of up-to-date and representative emissions as the key input to RAQDPS has been an on-going challenge. Two main set of emissions input files has been operationally used by the RAQDPS since 2015. These emissions were based on different version of Canadian Air Pollutant Emission Inventory (APEI), U.S. National Emission Inventory (NEI) and Mexican Inventory. An emission processing system called SMOKE was used to generate the hourly model-ready speciated and gridded files. The earliest set of operational emissions was based on 2010 Canadian APEI, 2011 U.S. NEI and 1999 Mexican inventory. In 2017, a newer version of emissions were prepared based on 2013 Canadian APEI, 2017 projected NEI for U.S. and 2008 Mexican. Recently, a latest set of emissions for GEM-MACH based on the 2015 Canadian APEI has been developed.

The decision to use a particular set of inventories for emission preparation is not always based on their representativeness of the year of predictions, but rather because those are the most recent available inventories at the time. Since available most recent emissions do not necessarily reflect the current emission levels, it is worth looking at the impact of choice of emission files on air quality forecasts of RAQDPS. In this work, we investigate the impact of three set of emissions listed above on predicted O3, NO2 and PM2.5 over Canada and U.S. for winter and summer period in 2017.

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**29.** **Assessment of Important SPECIATE Profiles in EPA’s Emissions Modeling Platform and Current Data Needs** *– Casey Bray, U.S. EPA*

The United States (US) Environmental Protection Agency (EPA)’s SPECIATE database contains speciated particulate matter (PM) and volatile organic compound (VOC) emissions profiles. Emissions profiles from anthropogenic combustion, industry, wildfires, and agricultural sources among others are key inputs for creating chemically-resolved emissions inventories for air quality modeling.  While the database and its use for air quality modeling are routinely updated and evaluated, this work sets out to systematically prioritize future improvements and communicate speciation data needs to the research community.  We first identify the most prominent profiles (PM and VOC) used in the EPA’s 2014 emissions modeling platform based on PM mass and VOC mass and reactivity. It is important to note that the on-road profiles were excluded from this analysis since speciation for these profiles is computed internally in the MOVES model. We then investigate these profiles further for quality and to determine whether they were being appropriately matched to source types while also considering regional variability of speciated pollutants. We then applied a quantitative needs assessment ranking system which rates the profile based on age, appropriateness (i.e. is the profile being used appropriately), prevalence in the EPA modeling platform and the quality of the reference. Our analysis shows that the highest ranked profiles (e.g. profile assignments with the highest priority for updates) include PM2.5 profiles for fires (prescribed, agricultural and wild) and VOC profiles for crude oil storage tanks and residential wood combustion of pine wood.  Top ranked profiles may indicate either that there are problems with the currently available source testing or that current mappings of profiles to source categories within EPA’s modeling platform need improvement.  Through this process, we have identified 29 emissions source categories that would benefit from updated mapping.  Many of these mapping mismatches are due to lack of emissions testing for appropriate source categories.  In addition, we conclude that new source emissions testing would be especially beneficial for residential wood combustion, nonroad gasoline exhaust and nonroad diesel equipment.

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**Chairs: Laurel Driver and Sarah Roberts, U.S. EPA**

**Wednesday, July 31, 2019**

8:00 – 8:25 am - **Collaboration to Improve the On-Road Sector of the 2017 NEI -** *A. DenBleyker, J. Koupal, R. Billings, Eastern Research Group, Inc;*

*A. Eyth, L. Driver, S. Roberts, U.S. EPA*

The 2017 National Emissions Inventory (NEI) is the fourth NEI to rely on EPA’s Motor Vehicle Emission Simulator (MOVES) model and the SMOKE-MOVES tools to produce on-road emissions for air quality modeling. When MOVES was first brought into the national modeling framework, few sources of local data were used, mainly the vehicle-miles traveled (VMT) by county. As of the 2017 NEI, over 30 state and local (S/L) agencies submit data in the form of county databases containing local data for a wider set of MOVES tables including VMT, population, age distributions, starts, extended idling hours, temporal distributions of VMT, speed, inspection/maintenance programs, and more. S/L agencies also actively review EPA’s on-road modeling efforts through a monthly convening of the multi-jurisdictional organization MOVES group, which has provided valuable feedback resulting in improvements in EI consistency by state. The Coordination Research Council (CRC) has sponsored several recent projects to purchase data for NEIs to improve model inputs for parts of the country that would otherwise not have local data. The latest study, CRC project A-115, purchased 2017 vehicle registration data and prepared MOVES inputs for the calendar years 2017 and 2016. This presentation focuses on several developments for the on-road sector of the 2017 NEI and 2016 version 1 modeling platform, including: the use of CRC A-115 vehicle registration data, new representative county groups, new data quality checks, and updates to SMOKE to directly use detailed MOVES-based hourly distributions of vehicle speeds from the CRC A-100 study. A

llison DenBleyker, John Koupal, Richard BillingsAllison DenBleyker, John Koupal, Richard

8:25 – 8:50 am *-* **Using Mobile Measurements to Update Onroad Transportation Emission Inventory** – *S. Zhang, K. M. Zhang - Cornell University;*

*H. Wang, X. Liang and Y. Wu, University of Beijing, China; P. Deshmukh, Jacobs Technology, Inc*

Portable emission measurement systems (PEMS) have effectively characterized potentially high real-world emissions as highlighted by the Volkswagen diesel emissions scandal. PEMS testing has been adopted by emissions regulations in the US, Europe and China but expensive instrument costs and lengthy set up and operations times can be a major limitation in implementation. This has led to the development of more cost-effective, efficient methods such as mobile chasing measurements, to improve current emissions inventories for on-road motor vehicles. In this study, a mobile platform was developed using a Minivan equipped with a series of fast-response pollutant analyzers for measuring CO2, CO, NO/NOX, particle number, and black carbon (BC) to identify real-world vehicle emission rates.

To evaluate the accuracy of mobile measurement results, we compared on-road measurements of NOx emissions between mobile chasing and PEMS for 12 heavy-duty diesel trucks in China. For each vehicle, multiple chasing tests were conducted on both freeways and local roads. Various data processing methods and key parameters were used to optimize an algorithm to calculate fuel consumption-based emission factors. The results show that, with multiple chasing results averaged, the relative errors of vehicle-specific emission factors for NOx results were within +/-20% compared with the PEMS results for all tested vehicles.

Since 2017, we have dispatched the mobile platform to measure thousands of vehicles across nearly ten provincial regions in China. The emission factors identified from these chasing measurement studies are being applied to improve key components of China’s on-road transportation emission inventory (called the EMBEV model). Key components of the EMBEV model being updated include after-treatment efficiency, characteristics of high emitting vehicles and emissions from natural gas vehicles. A significant contribution from chasing data has been the identification of higher ox emission factors than expected for selective catalytic reduction (SCR)-equipped trucks. These NOx emission factors are also important for near future (2020) air quality and health impact assessments being conducted using the EPA WRF/CMAQ modeling system.

8:50 – 9:15 am***-* Use of Telematics Data to Update the Heavy-Duty Vehicle Mileage –** *A. DenBleyker, S. Kishan, Eastern Research Group, Inc****.***

The latest U.S. on-road vehicle emissions models MOVES and EMFAC rely on relative mileage accrual rates to model the differences in the vehicle-miles traveled (VMT) by age. Mileage accrual patterns for a regionally-operating fleet generally show that newer vehicles travel more miles annually than older vehicles of the same category. Certain vocations of truck are the exception, such as drayage trucks operating at ports, thought to have less or no decline in annual VMT by age. As of March 2019, the primary data source for HDV accrual rates in both MOVES and EMFAC is the 2002 Vehicle Inventory and Use Survey (VIUS) in which a sample of over 136,000 trucks were surveyed to represent nearly 89 million trucks registered in the US. Unfortunately, funding for the VIUS was discontinued, leaving the emissions models without a survey update for over a decade. ERG is currently working with the fleet management company Geotab to analyze Geotab’s global positioning system (GPS) data form nearly 100,000 data loggers on HDVs to estimate 2018 annual mileage accrual by vehicle weight class, vocation, and model year. This presentation compares profiles from Geotab’s GPS telematics data to the 2002 VIUS to evaluate a potential update to the HDV mileage accrual rates in on-road emissions modeling.

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**Wednesday, July 31, 2019 – Cont’d**

9:15 – 9:40 am *–* **Planned Updates to EPA MOVES Emission Model for Heavy-Duty Onroad Vehicles –** *J. Han, G. Sandhu, D. Sonntag, and*

*D. Bizer-Cox, U.S. EPA*

Emissions from onroad heavy-duty vehicles continue to be an important area of focus concerning air quality in the U.S. Heavy-duty vehicles (HDVs) are expected to account for approximately one-third of total NOx emissions from transportation in 2025.1 HDVs are also significant contributors of other criteria pollutants including particulate matter.

US EPA’s Office of Transportation and Air Quality is working on several updates for future versions of EPA’s Motor Vehicle Emission Simulator (MOVES) to improve the estimation of emissions from onroad HDVs. They include:

* Updates to running and start exhaust emission rates for newer (mostly post-2010 model years) diesel, gasoline, and compressed natural gas (CNG) fueled HDVs using data from the manufacturer-run Heavy-Duty In-Use Testing program and EPA’s measurement programs.2
* Added capability to model emissions from “glider trucks” as part of the combination truck fleet.3
* Incorporation of truck idle activity that occurs off the road network (such as curb-sides, parking lots).
* Updates to idling, hotelling, and start activity based on instrumented truck studies.
* Expansion of the fuel options in modeling heavy-duty source types in MOVES.4
* Updates to model heavy-duty vehicle masses by vehicle type and weight class, using latest data such as Weigh-in-Motion data.

We will present the underlying modeling assumptions, data sources, and potential benefits of our planned model updates in improving emission inventory estimates.

10:00 – 10:25 am – **MOVES Light-Duty Emission Rate Evaluation in the Context of Reconciling Modeled and Ambient NOx –** *C. Toro, D. Sonntag,*

*J. Warila, D. Choi and M. Beardsley, U.S. EPA*

Some studies claim that the likely cause of summertime discrepancies between modeled and measured ambient nitrogen oxides is an overestimation of NOx emissions from mobile sources in the NEI. While the estimation of mobile NOx emissions in the NEI is a complex process that uses input data from a variety of sources, we focused specifically on the assessment and evaluation of the light-duty sector within the MOVES model. We evaluated a variety of potential areas of improvement such as emission rates, deterioration trends, relative mileage accumulation and air conditioning assumptions. We assessed each of these parameters against independent datasets and performed sensitivity exercises to understand the impact of each of these potential modifications on the inventory. Here, we summarize our findings and estimate the cumulative impact on the inventory of the potential changes compared to what the literature suggests is necessary to reconcile modeled and ambient NOx.

10:25 – 10:50 am – **Emissions Impacts of Electrifying Passenger Cars in Texas** *- C. Kite - Texas Commission on Environmental Quality*

Currently available electric passenger cars accumulate roughly 3.46 miles/kilowatt-hour (KWh) of battery charge. After accounting for charging and transmission/distribution losses, 356 megawatt-hours (MWh) of electricity are needed per million miles traveled. Texas coal and natural gas electric generating units (EGUs) emitted an average of 0.65 nitrogen oxides (NOX) pounds/MWh in the Summer of 2017, with rates as low as 0.2 NOX pounds/MWh in Dallas-Fort Worth (DFW) and 0.3 NOX pounds/MWh in Houston-Galveston-Brazoria (HGB). Using EGUs in these areas to charge electric vehicles would result in the following NOX gram/mile (gpm) rates: 0.03 gpm in DFW (equal to Tier 2 Bin 3); and 0.05 gpm in HGB (equal to Tier 2 Bins 4/5). Since light-duty fleets have low NOX emission rates under Tier 2 and Tier 3 standards, increased use of electric cars will not yield significant additional NOX emission reductions. However, increased use of electric cars will yield improvements in operational energy efficiency. During 2017, natural gas EGUs in Texas emitted 988 pounds/MWh of carbon dioxide (CO2), while coal EGUs emitted 2,117 pounds/MWh of CO2. Fuel consumption equivalence rates for electric cars were calculated at 53 miles/gallon (mpg) when natural gas is the source of electricity and 25 mpg when coal is the source. The highest ozone days in Texas typically occur during stagnant periods when wind power generation is at its lowest levels and overall demand for electricity peaks. Therefore, wind power contribution will be minimal during the highest ozone periods for reducing overall NOX emissions associated with transportation.

10:50 – 11:15 am - **Estimation of Mobile Source Toxic Emissions and Application in Planning and Policy** *– R. Cook, U.S. EPA*

More than one thousand compounds have been identified in exhaust and evaporative emissions from mobile sources. A number of these compounds, referred to as mobile source air toxics (MSATs), have cancer and non-cancer effects in animals and humans.

For most mobile sources, except commercial marine vessels, locomotives, and aircraft, MSAT emissions are estimated by U. S. EPA using the Motor Vehicle Emissions Simulator (MOVES). In this presentation, we will review general approaches used to estimate these emissions.

We will also discuss the application of these emissions data in developing regulatory and voluntary control programs. U. S. EPA has reduced mobile source air toxics dramatically through a combination of air toxics standards promulgated under Section 202(l)(2) of the Clean Air Act, as well as criteria pollutant controls that have MSAT co-benefits. However, risks remain elevated in some locations (e.g. near roads); these risks are also being addressed by voluntary programs.

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11:15 – 11:40 am - **Environment and Climate Change Canada’s Changes to the NONROAD Model –** *B. Taylor, Environment and Climate Change Canada*

NONROAD is a computer model originally developed by the United States Environmental Protection Agency (EPA) and used to calculate past, present and future emission inventories for all nonroad equipment categories, except commercial marine vessels, locomotives and aircraft. There have been many iterations of the NONROAD model, with NONROAD2008 being the final stand-alone version. Thereafter, EPA incorporated NONROAD in the MOVES2014 model.

Environment and Climate Change Canada (ECCC) undertook to modify the NONROAD2008 model, to better reflect Canadian conditions. ECCC enhanced the NONROAD model to fully exploit detailed data of the Canadian off-road vehicle and engine fleet, as purchased from Power Systems Research (PSR). The PSR data provided off-road vehicle and engine population data by Source Classification Code (SCC), model-year, fuel type and power range. NONROAD was then modified to accept a user-defined age distribution, as articulated by the PSR data.

As Canada has a unique mining activity in Oil Sands mining, the Canadian version of the NONROAD model was modified to include custom SCCs for the Oil Sands mobile mining fleet. This enabled a better representation of the power range, hours of use and capabilities typical of vehicles and engines in Oil Sands mining operations. ECCC also expanded NONROAD’s ability to model higher-ethanol blends, for potential policy scenarios. Similarly, the Canadian version of the NONROAD model was given the ability to estimate emissions under scenario uses of renewable biodiesel fuels, such as Fisher-Tropsch. Given that the NONROAD model already was able to assign fuel use at a high level of detail, ECCC embedded Greenhouse Gas (GHG) fuel-based emission factors within the Canadian version of the NONROAD model for testing purposes. With the off-road sector being such a great contributor to emission inventories (be they air pollutant or GHG), efforts to create models and data that defensibly and reasonably estimate these emissions, along with potential policy implications are of high value.

1:15 – 1:40 pm - **Towards an AIS Based Marine Emissions Inventory Model -** *M. Aldridge, D. Bizer-Cox, Jarrod Brown, S. Roberts*

The Automatic Identification System (AIS) has become a widely available source for commercial marine vessel activity data. Because of its high spatial and temporal resolution, and its broad use by commercial vessels, AIS data is ideally suited to form the basis of a bottom-up marine emissions inventory model. Using this data for emissions modeling provides many opportunities to refine model calculations and to simplify some modeling assumptions. The challenges of working with AIS data involve developing efficient methods to process and summarize huge quantities of AIS data without losing the detail that makes it so valuable. Here we present our approach to developing an emissions inventory for category three commercial marine vessels operating in U. S. waters using AIS data from 2017.

1:40 – 2:05 pm - **A Statewide Commercial Marine Vessel Automated Identification System (AIS)-Based Emission Inventory** –*S. G. Cone, Delaware Department of Natural Resources and Environmental Control*

Since 2008, Delaware has been creating a high resolution, bottom-up inventory to estimate emissions from category three (engine displacement greater than 30 liters) commercial marine vessels (CMV). CMV were responsible for a considerable portion of the state’s sulfur dioxide emissions in 2014, and also emit oxides of nitrogen (NOx). With some pre-processing of automated identification system (AIS) data provided by the Maritime Exchange, we have been able to create a reproducible inventory without the use of GIS. This talk will discuss the methodology used in creating this inventory, and the limitations of such an inventory, especially where ship engine data is not available, and methods for using acceptable alternatives such as fleet averages. Although EPA has announced that it will create CMV emission estimates for 2017, this talk will show how any agency with access to AIS data can create a high-resolution inventory of ship traffic in its state using only popular spreadsheet software. This inventory could then be used for policy modeling and decisions.

2:05 – 2:30 pm - **Methods to Estimate Emissions for Vessels Equipped with Category 1&2 Propulsion Engines Based on AIS Activity Data –**

H. Perez, I. Brown, and R. Billings, Eastern Research Group; L. Driver, U.S. EPA

With the introduction of new marine vessel Source Classification Codes (SCC), it is now critical to know what category propulsion engine a vessel is equipped with, in order to assign the correct SCC. Vessels with Category 3 (C3) engines are relatively easy to identify as classification societies have detailed records of their engine characteristics. Smaller vessels equipped with Category 1 and 2 propulsion engines (C1/2) are more challenging as there are no central data sources of vessel-specific attribute data. Without detailed data, emission estimates can only be developed based on “vessel types”, making it important that each C1/2 vessel be assigned an appropriate “vessel type”. This paper lays out the approach used to develop the C1/2 vessel component of the 2017 National Emission Inventory (NEI). For this project, US Coast Guards’ Automatic Identification System (AIS) data with the C3 vessels removed was provided. This dataset included 40,000 different Maritime Mobile Service Identity (MMSI) codes. Fishing buoys, search and rescue vessels, and man overboard transmitters were identified based on their MMSI code. Using Federal Communication Commission data, small commercial vessels and pleasure craft were differentiated. Larger recreational vessels that travel outside U.S. waters were also flagged. Military ships were identified using National Telecommunication and Information Administration (NTIA) data. A dataset of global fishing vessels was used to identify fishing boats based on their call signs. The AIS vessel type data field was considered last as this field is often incorrect. The paper will also note how the C1/2 emissions were calculated.

**International Emission Inventory Conference**

**MOBILE SESSION ABSTRACTS**

**Chairs: Laurel Driver and Sarah Roberts, U.S. EPA**

**Wednesday, July 31, 2019 – Cont’d**

2:30 – 2:55 pm - **Data Quality Tools Applied to AIS Data Enhance Accuracy of Emission Inventories** –*H. Perez, I. Brown, and*

*R. Billings, Eastern Research Group; L. Driver, U. S. EPA*

The quality of Automatic Identification System (AIS) data has improved drastically in recent years, making it increasingly useful as the primary data source for quantifying vessel traffic and marine freight movements for use in emission inventories. Eastern Research Group, Inc. evaluated the quality of hourly AIS observations that formed the basis of the marine vessel component of the 2014 Gulf wide Emissions Inventory Study. We also outline the quality checks that were applied to the AIS data to validate the data’s use in the 2014 inventory and future Bureau of Ocean Energy Management inventories. We mapped tens of millions of observations associated with nearly 9,000 vessels to check data quality, identify activity by vessel type, and investigate traffic patterns. Our extensive quality checks and vetting included comparing vessel operations to other independent data sources and validating spatial and temporal elements. The AIS data enabled us to identify specific vessels, document their location, and calculate engine load factors and hours of operation, which yielded a more refined inventory and understanding of vessel operations. Our approach resulted in more specific vessel types, more accurate emission estimates and spatial resolution compared to previous approaches that relied heavily on surrogates and default assumptions for vessel operations. As AIS coverage continues to improve spatially, temporally, and in terms of vessel coverage, it continues to be a promising data source for calculating more accurate marine vessel activity and emission calculations.

3:15 – 3:40 pm - **Advancing Nonroad Model Development through Data Partnerships -** *S. Roberts, C. Fulper, K. Dotzel, and J. Warila, U.S. EPA*

In the two decades since the release of EPA’s Nonroad model, new and compelling data collection methods have entered the nonroad sector. Public and private fleet managers are increasingly using on-board telematics, portable activity measurement systems (PAMS), and

fleet management software to collect and analyze vast amounts of data from nonroad vehicles and equipment. These measurement platforms generate a near-continuous stream of nonroad activity data such as fuel consumption, equipment turnover, and usage patterns (e.g.,

number of trips, hours of operation at idle vs. non-idle). In addition, advancements in Portable Emission Measurement Systems (PEMS) and their installation on nonroad vehicles and equipment has expanded our ability to measure nonroad emissions and engine loads during real-world

operations.

Incorporating such real-world activity and emissions data into the Nonroad model has historically posed a challenge for EPA, due primarily to a scarcity of data. To help overcome this challenge, EPA has cultivated partnerships with various state and local agencies, private fleets, and academic institutions, with the goal of leveraging our collective resources (e.g., PEMS and PAMS equipment, technical expertise, affiliations with nonroad fleet managers) to collect and analyze nonroad equipment activity and emissions data. In this presentation, we will provide an overview of EPA’s nonroad data partnerships and highlight some examples of how these collaborative efforts are informing the development of EPA’s updated

Nonroad model.

3:40 – 4:05 pm - **Developing Updated Activity Inputs for Nonroad Equipment –** *K. Dotzel and J. Warila, U.S. EPA*

EPA is in the process of exploring major revisions to its nonroad modeling platform. Planned revisions will be based on new data sources and model design techniques that have become available since the last major update to the NONROAD model in 2008—integrated into EPA’s MOtor Emissions Vehicle Simulator (MOVES) model in 2014. The updated model is expected to include new model inputs, new algorithms for calculating emissions, and a new design structure. This presentation will focus on recent efforts to develop updated activity inputs for diesel-powered nonroad equipment using commercially-available survey and auction-house data, sourced from state and local agencies and private firms. Specific topics to be covered include data-processing steps leading to the development of updated activity inputs for a subset of construction and agricultural equipment, how the results vary by region and engine-size class, and how these inputs compare to those currently in MOVES.

4:05 – 4:30 pm - **Building National High-Resolution Rail Inventories Through Regional Collaboration** - *M. Janssen, LADCO*

Regional groups have been building national rail inventories for 10 years. With the 2016 Collaborative these groups have been able to create higher quality national inventories for rail that eliminate most of the problems of past inventories. By working together leading states have been able to use remote sensing data to identify and populate rail yard activity data and include activity for Passenger and commuter rail into an open and transparent database of activity and emissions. Improved estimates of activity and a review of past emissions rates have led to better national rail inventories. Enhanced outreach tools are critical to get state and local involvement in inventory development when significant amounts of local data collection are needed.

**International Emission Inventory Conference**

**MOBILE SESSION ABSTRACTS**

**Chairs: Laurel Driver and Sarah Roberts, U.S. EPA**

**Wednesday, July 31, 2019 – Cont’d**

4:30 – 4:55 pm - **Updates to Agricultural Equipment Allocation Data in MOVES Model –** *A. Bollman and K. King, North Carolina Department of Air Quality*

The U.S. Environmental Protection Agency (EPA)’s MOVES model provides the ability for model users to estimate county-level emissions from equipment that is generally operated off of public roads. This equipment is classified as part of the nonroad emissions sector, and includes equipment used in agricultural operations. The current MOVES model allocates the estimated national population of agricultural equipment, and by extension, national agricultural emissions, to counties using county-level data for a surrogate indicator of agricultural activity. This indicator, the total acres of crops harvested in 2002, is outdated, and possibly less representative of agricultural activity than other available surrogates. For this effort, the North Carolina Division of Air Quality (NC DAQ) has developed an updated set of county allocation factors representing the most currently available official government statistics on fuel expenditures for agricultural production. The purpose of this (lightning talk/podium presentation) is to describe NC DAQ’s methods for developing updated county-level fuel expenditure data for allocating agricultural equipment/emissions in MOVES. The NC DAQ will also present the results of this effort, focusing on comparisons between the current MOVES model allocations and the proposed new model allocations.

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**AIR QUALITY MODELING SESSION ABSTRACTS**

**Chairs: Alison Eyth, U.S. EPA; Zac Adelman, LADCO**

**Wednesday, July 31, 2019**

8:00 – 8:25 am -**Accounting for Organic Compound Volatility in Standard Emissions Speciation Profiles, Databases and Models –** *B. Murphy,*

*H. Pye, M. Qin, G. Pouliot, U.S. EPA; Q. Lu, A. Robinson, Carnegie Mellon University; Madeleine Strum, U.S. EPA*

It has been shown that primary organic aerosol (POA) mass from combustion emissions evaporates as it is diluted to ambient conditions. Large-scale model studies have also shown that treating POA compounds as semi-volatile and accounting for secondary organic aerosol (SOA) from underreported precursor emissions has a significant impact on the average contributions from combustion sources as well as on the spatiotemporal variability of OA concentrations, particularly in urban areas and downwind of sources. Although many chemical transport models (CTMs) now include POA semi-volatile partitioning, standard emission databases (e.g. SPECIATE) and methods have only begun to account for these phenomena in emission profiles. With the release of SPECIATEv5.0, we have introduced profiles for mobile sources (vehicles, off-road mobile, and aircraft) that explicitly distribute organic mass among low volatility, semi-volatile, intermediate volatility and volatile organic compounds (LVOCs, SVOCs, IVOCs, and VOCs, respectively). The profiles have been shown to be highly consistent with existing mobile profiles in the VOC range. But much of the IVOC and SVOC mass has been underrepresented in the past and the new profiles offer a more complete picture of emissions in these ranges, and the resulting SOA formation that follows. To accommodate these important classes of pollutants, we have added new species to the SPECIATE database, with properties chosen to effectively propagate information about the partitioning behavior of emissions from individual sources to downstream models, including large-scale 3D models.

8:25 – 8:50 am - **Parameterization of MOVES Emission Factors Lookup Tables in SMOKE -** *B.H. Baek, C. Coats, and R. Pedruzzi, University of North at Chapel Hill*

Since the EPA introduced the MOVES (Motor Vehicle Emissions Simulator) in 2010, the SMOKE-MOVES integration tool was developed to integrate MOVES emission factors output with the SMOKE modeling system to develop the high quality onroad mobile emissions that are sensitive to local meteorological conditions (i.e., ambient temperature and relative humidity). The current SMOKE-MOVES integration tool performs reasonably well in reflecting local meteorological condition to gridded hourly mobile emissions for regional air quality modeling. However, processing the large ASCII files needed for ~302 MOVES emission factors lookup table files involves significant computing time and memory. There is also a high input/output (I/O) penalty in accessing the stored emission factors to estimate hourly mobile emissions for each grid cell. One single day SMOKE-MOVES run for 12km domain could takes approximately 1.15 hours per day with > 20 GB RAM memory. To address these computational resource limitations in air quality forecasting application, we have parameterized the current MOVES emission factors to the efficient 6th order polynomial numerical algorithms using the Best Curve Fitted Algorithms (BCFA) method with correlation coefficients ranging from 0.93 to 0.99. The preliminary CONUS 12km domain SMOKE-MOVES a single day run with MOVES POLY LUT shows up to 85 times faster (49 seconds compared to 4,165 seconds). We expect the more speed up with processing more number of MOVES lookup table files.

*8:50 – 9:15 am -* **Inventory MOVES with Hourly Meteorology for Use in Air Quality Models -** *G. Grodzinsky, K.-J. Liao, and J. Boylan, Georgia Department of Natural Resources*

On-road mobile emissions are a significant source of ozone precursor emissions in urban areas. Hence, these emissions are a critical input for photochemical grid models (PGMs) used in ozone attainment State Implementation Plans (SIPs). EPA uses SMOKE-MOVES to generate on-road mobile inputs for PGMs. SMOKE-MOVES uses hourly meteorology from meso-scale weather models and applies MOVES emission rates from representative counties to county-specific activity (e.g., VMT and VPOP) to generate hourly county-level emissions that are gridded and speciated. However, SMOKE-MOVES makes several simplifying assumptions such as similar age distributions, speed distributions, and ramp fractions between representative counties. Also, SMOKE-MOVES uses two fuel months and does not account for transition months. On the other hand, MOVES in inventory mode (inventory MOVES) can use county-specific age distributions, county-specific speed distributions, fuel months accounting for transition seasons, and county-specific ramp fractions. However, one simplifying assumption employed by inventory MOVES that is not employed by SMOKE-MOVES is that monthly-average diurnal (24 values/month) meteorological data is used to run the model. The work presented here will remove that simplifying assumption by using hourly meteorological data (air temperature and relative humidity from either observations or meso-scale weather models) in inventory MOVES to produce hourly county-level emissions for all ozone nonattainment counties in Georgia. The advantage of this approach is that it does not require any simplifying assumptions and is simpler to run as few states can run SMOKE-MOVES. Then, SMOKE will be modified to grid and speciate the hourly county-level emissions for use in PGMs.

**International Emission Inventory Conference**

**AIR QUALITY MODELING SESSION ABSTRACTS**

**Chairs: Alison Eyth, U.S. EPA; Zac Adelman, LADCO**

**Wednesday, July 31, 2019**

*9:15 – 9:40 am -* **SMOKE Updates: MOVES Processing Enhancements and New Spatial Surrogates Tool** **-** *B.H. Baek, C. Sepannen, University of North Carolina; A. Eyth, U.S. EPA*

The U.S. EPA Office of Air Quality Planning and Standards (OAQPS) has been developing an emissions modeling platform based on the latest National Emissions Inventory (NEI) for air quality models, CMAQ, CAMx, and AERMOD. It consists of all the emissions inventories and ancillary data files used for emissions modeling. The primary emissions modeling tool used to create the air quality model-ready emissions is the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system (http://www.smoke-model.org/). The latest SMOKE version 4.6 includes many enhancements and bug fixes to support U.S. EPA’s various air quality modeling applications. It includes the following: 1) New program “Lnkmerge” to process temporally and spatially highly resolved link-level emissions that can be represented by aviation, rail and onroad sources, 2) New PostgreSQL/PostGIS Spatial Allocator Tool to generate spatial surrogates for emissions gridding processing, and 3) Various SMOKE-MOVES Enhancements; Enhancing the representation of average speed distribution to onroad emission from RatePerDistance (RPD) mode; Correcting humidity impacts on NOx emissions from RatePerVehicle (RPV) mode; and New RatePerStart (RPS) mode that can estimate vehicle start emissions based on number of vehicle starts by vehicle type.

10:00 – 10:25 am - **The National Emissions Collaborative: A Cooperative Approach to Developing Emissions Modeling Platforms *-*** *Z. Adelman, LADCO; A. Eyth, U.S. EPA*

An Emissions Modeling Platform (EMP) is a data and software package that includes all of the information required for preparing air pollution emissions inputs for regional-scale air quality modeling. One application of EMPs is by federal, state, local, and tribal air planning agencies for developing air pollution mitigation plans pursuant to their obligations under the Clean Air Act. Starting with the release of the first versions of the 2002 National Emissions Inventory (NEI), the U.S. EPA produced and distributed to the public EMPs that they developed in-house to support their own modeling studies. At the request of regional, state, local, and tribal air agencies to make the EMP development process more cooperative, a National Emissions Collaborative was formed in late 2017 to develop the next national EMP for supporting air quality planning in the U.S. Following from a National Federal/State Workgroup effort that established that 2016 would be the next base year for national-scale air quality modeling in the U.S., the National Emissions Collaborative convened federal, regional, and state air agency staff to develop and prepare base and future year emissions data for a 2016 EMP. This presentation will describe the Collaborative process, participants, and timelines that produced 2016, 2023, and 2028 emissions data for national-scale air quality modeling in the U.S. In addition to summarizing the base and future year emissions data produced by the Collaborative, we will present lessons learned from the process.

10:25 – 10:50 am - **Development and Evaluation of the Biogenic Emission Inventories for the 2016 Collaborative Modeling Platform -** *D. Boyer, Texas Commission on Air Quality; J. Vukovich, U.S. EPA; M. Kosty Texas Commission on Air Quality; B. Kim, Georgia Department of Natural Resources*

As part of the 2016 collaborative modeling platform development, the biogenic workgroup was charged to deliver biogenic emission inventories for use in 2016 photochemical modeling to support future SIPs and other regulatory modeling. The workgroup created and evaluated hourly emission rate estimates for 2016 from the two main biogenic emission models: Biogenic Emission Inventory System (BEIS) version 3.61 and the recent release of the Model of Emissions of Gases and Aerosols from Nature (MEGAN) version 3.0. This presentation will discuss the emission inventory development methods, the comparison of the isoprene emission rates, and the limited availability of 2016 observations for model performance evaluation.

10:50 – 11:15 am – **Development of a Year 2016 Fire inventory for United States Through a Multi-Agency Inventory Collaboration Effort**

*J. M. Vukovich, U.S. EPA; J. Beidler, General Dynamics Information Technology*

Wildland fire has a significant impact on air quality in the United States. In past National Emissions Inventories (NEIs), wildland fires within the United States have been shown to be the largest-emitting PM2.5 source category. An Inventory Collaborative effort for year 2016 was organized to generate emissions inventories for use in an emissions modeling platform. The Collaborative effort consisted of federal, Multi-Jurisdictional Organizations (MJOs), state and other agencies. This effort included generating a wildfire and prescribed burn emissions inventory for the entire year of 2016. The challenges that occurred when generating an emissions inventory will be discussed. This inventory combines multiple sources of ground reports of fire information obtained from federal, state and tribal organizations with satellite detections from the Hazard Mapping System. We describe the methods used to prepare the inventory as well as spatial and temporal patterns observed in the fire activity and emissions.

11:15 – 11:40 am - **The 2016 National Emissions Inventory Collaborative: Modeling with the Beta Platform** – *W. Hao, J. Yun & E. Zalewsky, New York State Department of Environmental Conservation*

The modeling workgroup of the 2016 Inventory Collaborative was responsible for several tasks related to the emission inventories developed by the various workgroups. Among these were summarizing and evaluating the platform data, developing and testing SMOKE run scripts for processing the inventory files and platform packaging and documentation. NYSDEC performed several modeling runs with the 2016 Beta platform for the OTC 12-kilometer domain during the /months of May through August. Emission scenarios were developed using the two different biogenic emissions inventories (BEIS v3.6.1 and MEGAN v3.0) developed by the biogenic workgroup and two different EGU emission inventories, (EPA EGU and ERTAC), developed by the EGU workgroup. This presentation will summarize some of the work done by the modeling workgroup and present initial CMAQ and CAMx model results using the various scenarios above.

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**AIR QUALITY MODELING SESSION ABSTRACTS**

**Chairs: Alison Eyth, U.S. EPA; Zac Adelman, LADCO**

**Wednesday, July 31, 2019 – Cont’d**

1:15 – 1:40 pm – **Forecasting Point Source Emissions -** *K. S. Narasimhan, Virginia Department of Environmental Quality*

Being involved in projecting non-EGU point source emissions for the 2016 Emissions Modeling Platform Development Plan of EPA, the Author shares his approach modelled on demand and supply linked to population growth in projecting future emissions from all point sources.

In Virginia 50 EGUs account for 50% of all point source emissions while 80% of the balance arise from 30 of around 3,000 other permitted non-EGU sources. Such emissions are mostly due to consumption of different energy forms in meeting the demand for power, heat, or other commodities like paper products, building materials, chemicals, oil & gas, besides waste management. Future demand for them, more so power, are therefore linked to consumers, thus in effect to population growth. Accordingly, future emissions are grown in relation to population increase.

Future requirements for different energy sources are computed based on their consumption trend during

2011-2016 tied to anticipated growth in population. Emissions in 2018-2030 are then projected in proportion to 2016 values. Trends in changing energy mix and other known design and operational variations are accounted as necessary. Additionally, for EGUs, the projected performance of power plants of Dominion Virginia Power in meeting 70% of the state’s future demand is closely followed in applying factors on availability and net capacity utilization for each source as foreseen in their 2017 Integrated Resource Plan.

1:40 – 2:05 pm *–* **Introduction to the MARAMA Inventory Projection Spreadsheet Tool –** *S. McCusker, J. McDill, Mid-Atlantic Regional Air Management Association (MARAMA)*

Since 2007 MARAMA has been perfecting a Projection Spreadsheet Tool for use with regional emissions inventories. The tool can be used to create both growth and control strategies for a wide range of base and future years, integrating both widely-available datasets such as those provided by the Energy Information Administration as well as state information such as permits and consent decrees. For the 2011 base inventory MARAMA extended the spreadsheets to integrate Ozone Transport Commission (OTC) control strategies and to cover the entire OTC modeling domain. For the 2016 collaborative inventory platform we shared the tool nationally and developed projection factors for states in the Mid-Atlantic and Northeast. The presentation will include a demonstration of the tool to illustrate some of its benefits.

2:05 - 2:30 pm -**MANE-VU Modeling Inventory -** *J. Jakuta, Government of the District of Columbia; H. Ashenafi, E. Bull, D. Healy, K. Knight,*

*S. McCusker, MARAMA*

In August 2018 the Mid-Atlantic Northeastern Visibility Union (MANE-VU) agreed to an “Ask” outlining the strategies and controls that were needed for MANE-VU Class I States to make Reasonable Progress by 2028 under the Regional Haze Program. The “Ask” of MANE-VU and upwind states consisted partially of optimizing nitrogen oxides (NOX) post combustion controls during winter months, conducting four-factor analyses on high emitting sources, adopting the MANE-VU low sulfur fuel oil rule, and controlling High Electric Demand Day units. These strategies and controls were analyzed and incorporated into a control case modeling inventory using the Eastern Regional Technical Advisory Committee's (ERTAC) EGU Projection tool for electric generating units (EGUs) and the Mid-Atlantic Regional Air Management Association's (MARAMA) installation of the Emissions Modeling Framework (EMF) for non-EGU point sources and nonpoint sources. This presentation will look at how these tools were used to develop the control case modeling inventories for the EGU, non-EGU point, and nonpoint sectors, the changes in the inventory that resulted from these applications, and how modeling results were affected.

2:30 – 2:55 pm *-* **Development of the 2028 Emissions Inventory for Regional Haze Modeling for the Ten Southeastern States –** *R. Oommen,*

*S. Enoch, and B. Do, Eastern Research Group, Inc; J. Hornback, Metro 4/SESARM; J. Boylan, Georgia Department of Natural Resources; R. Strait, North Carolina Department of Environmental Quality*

This presentation describes how Southeastern States Air Resource Managers, Inc. (SESARM) developed a projected 2028 emissions inventory to support air quality modeling and other technical needs for developing regional haze state implementation plans. The ten SESARM states (AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV) are collaborating through Visibility Improvement - State and Tribal Association of the Southeast (VISTAS).

In the SESARM states, SO2 emissions from stationary point sources continue to be a primary source of visibility impairment. Therefore, the inventory effort focused on improving emissions projections for stationary point sources. Emissions in EPA’s 2011/2028v6.3el modeling platform provided a good starting point. However, for EGUs, this modeling platform considered the impacts of the Clean Power Plan (CPP) which was vacated. Therefore, EGU emissions for 2028 were revised to exclude the CPP. For the VISTAS states, each state considered emissions in EPA’s 2023en modeling platform and 2028 emissions from the ERTAC EGU projection tool as the basis for developing 2028 emissions that best reflect projected activity levels. For non-VISTAS states, EPA’s 2028el forecast was replaced with the ERTAC 2028 forecast to exclude the CPP, and small EGUs emissions in EPA’s 2028el forecast were replaced with EPA’s 2023en forecast that excluded the CPP.

For non-EGU point sources, states used or revised emissions in EPA’s 2028el and/or 2023en modeling platforms, or developed new projections incorporating facility closures and control programs not reflected in EPA’s modeling platform. For other sectors, states relied on the emissions included in EPA’s 2028v6.3el modeling platform.

**International Emission Inventory Conference**

**OIL AND GAS SESSION ABSTRACTS**

**Chairs: Regi Oommen, ERG; Tom Moore, WRAP**

**Wednesday, July 31, 2019**

8:00 – 8:15 am - **U.S. Upstream Oil and Gas Methane Emissions Estimated with Inventory Model Incorporating Site and Component-Level Data**

*D. Lyon, R. McVay, M. Omara, H. Hull, D. Zavala-Araiza, R. Alvarez, S. Hamburg, Environmental Defense Fund*

Alvarez et al 2018 estimates that 2015 U.S. oil and gas supply chain methane emissions were 13 million metric tons, ~60% higher than the EPA GHG Inventory, by synthesizing multiple data sources including over 400 site-level measurements from 6 basins. Emission estimates were validated with aerial mass balance measurements from 9 basins but were higher than an alternative, component-level inventory. This difference was attributed to the ability of site- and basin-level approaches to quantify emissions from abnormal conditions and other avoidable issues that are not easily measured or categorized with traditional, bottom up approaches. We build on the work of Alvarez et al 2018 by developing a nationwide model for upstream O&G that integrates their site- and component-level approaches to estimate 2017 emissions using several data sources including the EPA GHG Reporting Program and Drilling info. For site-level emissions, we include new Other Test Method 33A measurement data from ~90 Permian Basin production sites. The model incorporates basin-level data when available but can estimate emissions at finer spatial scales down to site-level, which allows generation of custom spatially gridded inventories. We summarize model development and provide a few examples of its value for validating emission inventories and guiding emission mitigation.

8:25 – 8:50 am - **Collaborative Steps to Improve the Oil and Gas Emission Inventory in Several Western US States -** *J. Grant, A. Bar-Ilan, Ramboll;*

*T. Moore, WESTAR/WRAP*

On-shore oil and gas criteria air pollutant emission inventories are a key component of air quality planning in many areas across the U.S. State and local agency programs to compile oil and gas emission inventories vary substantially, leading to regional oil and gas emission inventories that do not have uniform currency or quality. The purpose of this project is to update the base year 2014, representative baseline (to represent activity, practices, and equipment in use from approximately 2014 to 2018) and develop the future year 2028 emission inventory for the 15-state Western Regional Air Partnership (WRAP) region. This region includes several emerging and mature oil and gas basins in the western U.S. which are transforming at various rates to access shale formations; these basins account for 35% of U.S. oil and 28% of US gas production in 2017. To enhance the WRAP region oil and gas emission inventory, we collaborated extensively with agencies under the direction of the agency led WRAP Oil and Gas Working Group (OGWG). The WRAP OGWG developed a comprehensive emission inventory framework, incorporating flexibility to tailor analyses by state and/or basin. Within this framework, we leveraged agency knowledge and resources to (1) collect upstream survey data for several oil and gas basins to enhance emission inventory inputs accuracy, (2) develop basin-level oil and gas activity forecasts, and (3) develop on-the-books and potential additional control emission control scenarios. The products of this work are base year and future year oil and gas emission inventories that have been informed by extensive agency collaboration.

8:50 – 9:15 am - **Federal Lands Greenhouse Gas Emissions and Sequestration - A Modified EPA Methodology** – *M. D. Merrill, B. M. Sleeter,*

*P. A. Freeman, J. Liu, P. D. Warwick, B. C. Reed, U.S. Geological Survey.*

Using a modified EPA methodology with state-level outputs, the U.S. Geological Survey (USGS) has produced an estimate of the greenhouse gas emissions associated with fossil fuel energy production on Federal lands and the end use of that fuel regardless of location. The estimate also includes ecosystem carbon emissions and sequestration on those same lands. The outputs of these emissions estimates span a 10-year period (2005–2014) and are reported for all states and two offshore areas.

Nationwide, in 2014, emissions from fossil fuels produced on Federal lands were 1278.7 million metric tons of CO2 equivalent (MMT CO2 Eq.) for CO2, 47.6MMT CO2 Eq. for CH4, and 5.5 MMT CO2 Eq. for N2O. Emissions from Federal lands fossil fuels represent, on average, 23.7% of U.S. emissions for CO2, 7.3% for CH4, and 1.5% for N2O over the 10 years. The rate of net carbon uptake in ecosystems ranged from sequestration of 475 MMT CO2 Eq. per year to emission of 51 MMT CO2 Eq. per year due to annual variability in climate and weather, changes in rates of land use, and other factors.

The CO2 net emissions is the difference between the emitted and sequestered CO2. At the National level, the USGS estimates that Federal land ecosystems sequestered an average of 195 MMT CO2 Eq. per year between 2005 and 2014, offsetting approximately 15% of the CO2 emissions from Federal lands fossil fuels extraction and use.

9:15 – 940 am - **Development of the 2016 Nationwide Oil and Gas Emissions Inventory: Data Collection, Emissions Estimation, and Spatial, Speciation, and Temporal Modeling Surrogates -** *R. Oommen, H. Perez, L. Dayton, M. Pring, and B. Do, Eastern Research Group, Inc; A. Eyth,*

*J. Snyder, M. Strum, and J. Vukovich, U.S. EPA*

The exploration and production of oil and gas have increased in terms of quantities and locations over the last seven years primarily through the use of new technologies, such as hydraulic fracturing. As part of a special 2016 emissions inventory for modeling, county-level emission estimates of the oil and gas sector for 34 states and 1,145 counties were prepared. Since the 2011 NEI, the oil and gas sector emissions have been more comprehensive on a geographic, source category, and pollutant coverage basis when compared to prior NEI base years for this sector.

The purpose of this presentation is to summarize the data collection efforts and emissions estimates developed for the 2016 nationwide oil and gas emissions inventory. This also includes the development of spatial and temporal modeling allocation factors using data primarily from a third-party database of oil and gas wells as well as other sources. Spatial allocation factors at both the 2-km and the 4-km grid scale level (including Alaska) were developed, as were monthly temporal allocation factors by SCC, which are useful for air quality modeling. Finally, the flaring/venting GSREF VOC profile data and HAP augmentation factors were updated based on the 2016 emissions data.

**International Emission Inventory Conference**

**OIL AND GAS SESSION ABSTRACTS**

**Chairs: Regi Oommen, ERG; Tom Moore, WRAP**

**Wednesday, July 31, 2019 – Cont’d**

10:00 – 10:25 am - **Wyoming AQD – New Process for Collecting Oil and Gas Production Site Inventories -** *B. Way, Wyoming Dept. of Environmental Quality*

The Wyoming Air Quality Division is embarking on a new procedure for collecting emissions inventories from oil and gas production sites, with the objectives of improving the overall inventory completeness as well as the consistency of emissions calculations. Detailed facility inventories of all 30,000+ active production sites will be constructed in the Division’s IMPACT data management system, using the same “facility tree” (emission unit >> process >> control equipment >> release point) protocol as for other minor point sources and Title V facility inventories. These inventories will then be extracted into Excel workbooks and transmitted to industry who will then enter unit- and process-level operating parameters and production information for each well site. These operating parameters and production data will then be captured into an emissions calculation tool designed to process the complex calculations for dehydration units, tanks and truck loading operations, as well as more standard calculations for heaters, engines, etc. The resulting estimated emissions will then be uploaded into the IMPACT data management system, generating separate emissions inventories for each well site. The process to report these emissions to EPA will roll everything up to the county level and appropriate SCCs to report them as non-point sources.

10:25 – 10:50 am - **EPA’s Nonpoint Oil and Gas Emissions Estimation Tool Improvements for 2017 -** *M. Pring and R. Oommen, Eastern Research Group, Inc; J. Snyder, U.S. EPA*

Nonpoint source emissions from the oil and gas exploration and production sector has gained interest in recent years as drilling technology has allowed increased development of unconventional oil and gas plays (such as shale or tight sands). While the major emissions sources associated with oil and gas production 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 were not as well characterized. To address this deficiency, EPA’s Office of Air Quality Planning and Standards (OAQPS) developed the Nonpoint Oil and Gas Emission Estimation Tool (Tool) in 2012 to develop nonpoint oil and gas emission estimates for the 2011 National Emissions Inventory (NEI). The Tool was further refined though a collaborative effort between EPA, states, and various non-governmental organizations (NGO) to develop the 2014 NEI for upstream oil and gas sources. This paper presents a summary of the improvements made to the tool to develop the 2017 inventory. OAQPS has continued to work closely with other EPA offices, states, and NGOs to identify areas for improvement. These improvements include incorporation of 2017 data from Subpart W of the GHGRP, the addition of new source categories to the tool, the updating of emission factors, and various process parameter updates as provided by state and local tool users.

10:50 – 11:40 am – **Panel Discussion** - A. Bar-Ilan, Ramboll.

A Panel discussion with representatives from industry, EPA, and state inventory developers, will address the key needs and focuses of oil and gas emission inventories, the reporting of emissions by operators to state, federal and regional agencies, and chief concerns in developing oil and gas emission inventories. Panelists TBD

**International Emission Inventory Conference**

**COMBINED AIR EMISSIONS REPORTING SESSION (CAER) ABSTRACTS**

**Chairs: Julia Gamas, U.S. EPA and Tammy Manning, North Carolina DEPT OF Environmental Quality**

**Wednesday, July 31, 2019**

3:15 – 3:40 pm - **The Combined Air Emissions Reporting (CAER) Project Common Emissions Form -** *Julia Gama, U.S. EPA*

The goal of the CAER project is to streamline the way industry reports air emissions to meet EPA and state/local/tribal (SLT) program requirements. The “Common Emissions Form” (CEF) will be an electronic reporting tool that will allow facilities to report to more than one program by submitting only once. The project is moving from concept to reality as development of the CEF is under way. This presentation will focus on work done up to date. The completion of a first-year pilot, a skeletal prototype of the CEF, is planned for Summer 2019. It will be used to prototype the ability of facilities from the state of Georgia to report air emissions data to the National Emissions Inventory (NEI), the Toxics Release Inventory (TRI, and state-specific air emissions program (SLT EI). Work towards the pilot is taking place in many areas. Data requirements, both for facility data and air emissions data, have been gathered by the research and development teams, and additional requirements are being gathered specifically for Georgia. Work of four product design teams will be of immediate use in the CEF including: a comparison of TRI, NEI and SLT EI programs and their data requirements, research on data fields needed at the facility and sub-facility level, quality assurance and quality control checks for submissions; and the creation of a state-specific emission factor compendium. Additionally, information technology solutions are being created so that the CEF can interact with the Emissions Inventory System and the Toxics Release Inventory Made Easy submission system. Once the pilot is ready, the CEF will continue to be developed towards production of a full minimum viable product by Summer of 2020, and beyond.

3:40 – 4:05 pm - **Combining and Streamlining Data: How SLTs Could Get More Out of CAER -** *T. Manning, North Carolina Department of Environmental Quality*

In addition to streamlining reporting emissions for facilities, the Combined Air Emissions Reporting (CAER) project may increase internal productivity for states, local programs and tribes. North Carolina’s dynamic data collection system, Internet-Based Enterprise Application Management (IBEAM) began development in 1999 and includes many integrated modules that collect compliance, emission inventory, facility and permitting data. This system is not connected to the federal programs included in the CAER project. One vision for the CAER project is allowing existing state systems to interface with the Federal programs in CAER project: EPA’s Emission Inventory System (EIS), the Greenhouse Gas Reporting Program (GHGRP), Compliance and Emissions Data Reporting Interface (CEDRI) and Toxics Release Inventory (TRI).

Here are a few examples where this interface could benefit North Carolina:

* Save Time and Money - North Carolina creates a multi-pollutant emission inventory in an Access database by combining facilities data from IBEAM, local program, event, nonpoint, nonroad and onroad data from EIS and greenhouse gas data from GHGRP’s FLIGHT system. Automatically loading and incorporating these data into IBEAM would be more efficient, reduce errors, and be more cost effective.
* Reduce Reporting – Connecting IBEAM and CEDRI allows staff easier access to stack test reports and eliminates the need for certain reports to be sent to CEDRI and NC separately.
* Data Quality – Incorporating TRI data into IBEAM could help facility wide toxic air pollutant QA checks to increase consistency across programs.

4:05 – 4:30 pm **- SLT/NEI/TRI Research Project: Program Comparisons and Recommendations for CAER –** *M. Strum, U.S. EPA; C. Y. Wu, Minnesota Pollution Control Agency; S. Griffin, J. Drukenbrod, J. Parra, U.S EPA; R. Banas, Michigan Department of Environmental Quality; C. Wilbanks, South Carolina Department of Health and Environmental Control; D. Basnight, Georgia Department of Natural Resources*

In 2017 and 2018, a Combined Air Emissions Reporting (CAER) project team researched commonalities and differences across EPA’s Toxics Release Inventory (TRI), and National Emissions Inventory (NEI) programs and State, Local Tribal (SLT) emission inventory (EI) programs and explored workflows for sharing air emissions data across these programs. EPA and SLTs staff quantified differences in emissions of pollutants from facilities common to both programs and performed case studies to identify reasons why toxic air emissions for a facility can be different in NEI than in TRI. Results led to better understanding:

* overlaps between TRI and NEI: facilities and pollutants/chemicals covered by both programs, and the quantity of overlapping emissions from these facilities;
* differences between TRI and NEI: regulatory and programmatic differences, discrepancies of reported emissions quantities for overlapping facilities and pollutants/chemicals (supported by case studies developed to illustrate reasons for such discrepancies);
* current quality assurance (QA) procedures for each program that involve using other programs’ data (e.g., TRI informed by NEI air emissions, NEI informed by TRI reported air waste streams), from which specific recommendations were developed for improved cross-program QA and data sharing coordination.

Crosswalks were developed for common data fields: pollutants/chemicals, emission calculation method/basis of estimate codes, and control/waste treatment codes. This presentation will highlight the findings and describe improvements to SLT-EI, NEI and TRI programs resulting from this effort.

**International Emission Inventory Conference**

**COMBINED AIR EMISSIONS REPORTING SESSION (CAER) ABSTRACTS**

**Chairs: Julia Gamas, U.S. EPA and Tammy Manning, North Carolina DEPT OF Environmental Quality**

**Wednesday, July 31, 2019 – Cont’d**

4:30 – 4:55 pm - **Demonstration of the Maine Air Inventory Reporting (Information) System (MAIRIS) -** *Stacy R. Knapp, Maine DEP*

The Maine Department of Environmental Protection presents a demonstration of the Maine Air Inventory Reporting (Information) System (MAIRIS). MAIRIS is a web application used by facilities to report criteria air pollutant, greenhouse gas, and hazardous air pollutant emissions estimates for the annual state point-source inventory. This best-practices demonstration is intended to highlight the features users find most helpful and might be considered for inclusion in the Common Emissions Form (CEF) being developed by the Combined Air Emissions Reporting (CAER) project. Through integration with Maine’s Environmental Facility Information System MAIRIS is prepopulated each year with units, processes, exhaust points, controls, and location information for every facility expected to report. Emission factors are carried over from year to year to streamline reporting, and the Department continuously strives to improve suggested and default emission factors. Now in its tenth year, MAIRIS has been fine-tuned to best meet the needs of both the submitting facilities and the Department. Significant investment is made in annual improvements based on facility user suggestions as well as by the Department’s data review team. The demonstration will include a walk-through of the full submission process highlighting features that have changed or improved over the years and why. Reports used for data review by the Department will also be shared, demonstrating the efficient review of each year’s submission details with side-by-side comparison to the previous year. Feedback and discussion will be encouraged during and after the presentation with the goal of identifying a wish list for inclusion in the CEF.

**International Emission Inventory Conference**

**TOOLS SESSION ABSTRACTS**

**Chair: James Beidler, General Dynamics IT**

**Wednesday, July 31, 2019**

1:15 – 1:40 pm - **Using SLEIS for Efficient Emissions Inventory Management -** *B. Smith and K. Jeffery, Windsor Solutions, Inc.*

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

Since being completed in early 2012, SLEIS is now being used by eighteen regulatory agencies across the country, including state, local, and tribal authorities. As SLEIS has matured, a number of exciting new features have been added to the software. Significant improvements have been made, with support for advanced emissions calculations using WebFIRE formulas, minor source inventories, integration with SCC Web services, and multi-report submission, among others.

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.

1:40 – 2:05 pm - **Enhanced WebFIRE Table for Online Emissions System -** *S. Hanks, Utah Division of Air Quality*

This presentation illustrates the development of an enhanced WebFIRE table used in the State and Local Emissions Inventory System (SLEIS) implemented by Utah Division of Air Quality (UDAQ). The enhanced WebFIRE table now includes harmonized units of measure for emission factors associated with SCC’s where units of measure were not uniform for all pollutants. It also provides the use of optional throughput units of measure for various SCC’s along with complete sets of corresponding emission factors thereby allowing greater flexibility to users. Emission factors for pollutants such as PM2.5 were developed and added when not available in the original WebFIRE table. In addition, state specific non-road emission factors were developed and added for non-road SCC’s. Formulas available in the original WebFIRE table were reformatted in order to be readable by SLEIS. A uniform nomenclature for formula calculation parameters (e.g., % Silt, Speed, % Sulfur) in the original WebFIRE table was developed and implemented. In addition, the use of paved and unpaved road formulas was greatly expanded by associating the formulas with any SCC’s pertaining to roads. The enhanced WebFIRE table enables extensive built-in calculation capabilities for SLEIS thereby simplifying the emission inventory submittal process and reducing the workload for regulated sources. It also ensures QA/QC and provides guidance to regulated sources as they enter and submit emissions data.

2:05 – 2:30 pm - **Arizona Regional Emissions Inventory Database Collaboration -** *H. Valenzuela, E. Raisanen, J. Uebelherr, Maricopa County Air Quality Department; R. Eberle; Gila River Indian Community; C. Anderson, UNICON*

The Maricopa County Air Quality Department, Gila River Indian Community Department of Environmental Quality, Pinal County Air Quality, Pima County Air Quality, and Fort McDowell Yavapai Nation collaborated to develop a regional emissions inventory database. This platform (IMPACT) is designed as an emission inventory reporting tool to gather, share, and distribute regional air quality data and reduce the resource burden among partners. This single source electronic database is useful for emissions e-reporting to EPA, data sharing, regional modeling, and compliance and enforcement. The partner agencies developed a work plan and participated in iterative meetings to meet benchmark deadlines for project target progress. The completed software platform is based on a Wyoming version of IMPACT customized for Arizona with an eye towards ensuring usability across multiple jurisdictions. The objective of the project is to reduce reporting burden and improve data consistency among partner agencies, increase data accuracy, and promote participation from the regulated community. In the near future, the database will be deployed across partner agencies and will utilize the EPA’s Virtual Exchange Services (VES) allowing partner jurisdictions to send their data both to the EPA and also to the regional database via sharing tables.

2:30 – 2:55 pm - **Updates to the EPA Facility Widget for Sub-Facility Details –** *M. R. Houyoux, S. Dombrowski, J. Drukenbrod, and E. Goehl   
U.S. EPA*

A cross-office team from EPA’s Office of Air and Radiation (OAR) and Office of Mission support (OMS) has updated the Facility Registry Service (FRS) Facility Widget and FRS web services to collect “sub-facility” data from industry stakeholders. This presentation will demonstrate the results of these efforts as shown by a user interface as well as the initial steps taken to support bulk upload of facility data. The project stemmed from OAR’s need to collect sub-facility and emissions data for the Residual Risk and Technical Review (RTR) program. The FRS-RTR project’s goal was to help standardize and streamline such data collection using the Compliance and Emissions Data Reporting Interface (CEDRI) and FRS services. With the expanded Facility Widget, industry stakeholders can use the Facility Widget to provide sub-facility data when reporting compliance data in CEDRI, which then sends that data to FRS for sharing with other programs. This updated Widget complements other ongoing data collection for the National Emissions Inventory, for which state, local, and tribal (SLT) air agencies provide sub-facility information. At times, industry has requested providing more details about facilities than the SLT agencies can provide, and so this tool will provide a mechanism for such voluntary submissions. The lessons learned from this project also provide a stepping stone on which the Combined Air Emissions Reporting (CAER) project can build, to help streamline air emissions reporting across EPA and SLT programs.

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**TOOLS SESSION ABSTRACTS**

**Chair: James Beidler, General Dynamics IT**

**Wednesday, July 31, 2019 – Cont’d**

3:15 – 3:40 pm – **Changes to the Emission Inventory System (EIS) for 2020** – *J. Miller, U.S. EPA*

To provide bulk amounts of data to EPA’s Emissions Inventory System (EIS), users submit their data in an XML file consistent with the Consolidated Emissions Reporting Schema (CERS). The CERS schema was first used in the 2008 emissions inventory cycle. The schema has largely been unchanged since this time. EPA is undertaking a series of initiatives to promote data sharing and data consistency between systems. This requires EIS to track and maintain additional data elements. For EIS to process these new data elements and structures in a batch mechanism, changes to the CERS schema are necessary. Schema changes are quite disruptive and require additional programming and testing resources for all participating organizations. As such, significant changes to the schema rarely occur. However, these occurrences do provide the opportunity to make other wanted changes to underlying data structures needed by the organization. These types of changes naturally occur throughout the lifecycle of an application as business needs mature and change. The presentation will outline the how the CERS schema will be changing, the timeline of how these changes will be deployed, and things to consider when implementing these changes on your local environments.

3:40 – 4:05 pm - **National Residential Wood Combustion Survey Results -** *D. Cooley, and J. Dorn Abt Associates R. Mason, U.S. EPA*

Residential wood combustion is a significant source of particulate matter emissions, resulting in more than 260,000 tons of primary PM2.5 emissions in the 2014 NEI. This presentation will discuss the results of a nationwide survey on wood-burning activity in the United States, including estimates of the fraction of homes using each type of wood-burning appliance and the amount of wood burned per appliance. The survey was funded by the Council for Environmental Cooperation, and was implemented by NESCAUM and Abt Associates, with support by the U.S. EPA. The survey fills a large gap in data on wood-burning activity for many regions of the United States, and the survey results are being used to improve the emissions estimates of the Residential Wood Combustion Tool for the 2017 National Emissions Inventory.

4:05 – 4:30 pm - **ECHO Clean Air Tracking Tool (ECATT)** - *M. Barrette, R. Kane, and J. Yourish, U.S. EPA*

The ECHO Clean Air Tracking Tool (ECATT) is a tool that makes it easy to use air monitoring stations to find pollutant and cancer-risk hotspots and analyze related data to identify potential contributors. It is a one-stop shop for Clean Air Act data that can be used for air quality analysis. ECATT includes emissions data from the Toxics Release Inventory (TRI), Greenhouse Gas Reporting Program (GHGRP), Emissions Inventory System (EIS), and Clean Air Markets Division (CAMD) programs, as well as evaluation and compliance data, facility classifications, air monitoring station data, and toxic risk data. The tool has the functionality to help identify facilities that may be under-permitted based on reported emissions by cross-referencing that data with permit information from ICIS-AIR. ECATT includes two key reports – the Air Pollutant Report, which displays emissions data and trends at a facility level; and the Air Monitoring Station Report, which allows users to investigate readings of Hazardous Air Pollutants at air monitors, rank nearby point sources based on their emissions, and use meteorological information to help analyze which facilities may be contributing to high readings. Version 1 of ECATT was launched in June 2017 and piloted with states and Regions. Based on feedback, Version 2, slated for release in Spring 2019, will offer several new features, including an improved mapping component which will allow ranking monitors by pollutant readings, cancer risk, or hazard quotient, and more up-to-date data. ECATT (ECHO Gov Login Required) https://echo.epa.gov/trends/air-monitoring-stations

4:30 – 4:55 pm - **Reflecting on Progress since the 2005 NARSTO Emissions Inventory Report -** *M. Day, G. Pouliot, K. Baker\*, M. Beardsley#, G. Frost&, B. Henderson\*, S. Hunt^, V. Rao\*, H. Simon\*, T. Yelverton, U.S. EPA; D. Mobley U.S. EPA (Retired)*

Emission inventories are the foundation for cost‐effective air quality management activities. In 2005, a report by the public/private partnership known as the North American Research Strategy for Tropospheric Ozone (NARSTO) evaluated the strengths and weaknesses of North American emissions inventories and made recommendations for improving their effectiveness. This paper reviews the recommendation areas and briefly discusses what has been addressed, what remains unchanged, and new questions that have arisen. The findings reveal that the emissions inventory improvement areas identified by the 2005 NARSTO publication have been explored and improved to some degree. The U.S. National Emissions Inventory has become more detailed and has incorporated new research into some previously under‐characterized sources such as biomass burning. Additionally, it is now easier to access the emissions inventory and the documentation of the inventory via the Internet. However, many emissions‐related research needs exist, such as research into emission estimation methods, speciation, scalable emission factor development, incorporating results of new emission measurement techniques, uncertainty, top‐down verification, uncharacterized sources, and estimation method comparability. A common theme throughout this retrospective summary has been the need for increased coordination among stakeholders. Researchers and inventory developers must work together to ensure that planned emission research is inventory‐relevant, scalable in terms of applications to regional and national inventory development and new findings can be used to update the emissions inventory. To continue to address emissions inventory challenges, industry, the scientific community, and government agencies need to continue to leverage resources and collaborate as often as possible. As evidenced by the progress noted, continued investment in and coordination of emissions inventory activities will provide dividends to air quality management programs across the country and world. Impact/Purpose Statement In 2005, a report by the public/private partnership North American Research Strategy for Tropospheric Ozone (NARSTO) evaluated the strengths and weaknesses of North American air pollution emissions inventories. This paper reviews the eight recommendation areas and briefly discusses what has been addressed, what remains unchanged, and new questions that have arisen. Although progress has been made, many opportunities exist for the scientific agencies, industry, and government agencies to leverage resources and collaborate to continue improving emissions inventories.

**International Emission Inventory Conference**

**TOOLS SESSION ABSTRACTS**

**Chair: James Beidler, General Dynamics IT**

**Thursday, August 1, 2019**

8:00 – 8:25 am - **Updates to Version 4 of the Biogenic Emissions Landuse Database (BELD4) for Canada and Impacts on Biogenic VOC Emissions -** *J. Zhang and M. D. Moran, Environment and Climate Change Canada; Z. He, SOLANA Networks Inc., Canada*

Biogenic volatile organic compounds (VOCs) released from terrestrial vegetation account for 80-90% of total global VOC emissions. A detailed database of vegetation types with relatively high spatial resolution is required for accurate estimation of biogenic VOC emissions. The Biogenic Emissions Landuse Database (BELD), which covers most of North America, has been used by many regional air quality models to estimate biogenic emissions. In 2013 the U.S. EPA updated BELD from Version 3 with 230 vegetation classes to Version 4 with 286 landuse categories for the contiguous United States but retained 17 broad landuse types for Canada and Mexico based on MODIS satellite retrievals (Bash et al., 2016). A U.S.-equivalent BELD4 landuse database for Canada was subsequently compiled by Environment and Climate Change Canada (ECCC) based on the 2001 Canadian National Forest Inventory (NFI) with 109 tree species at 250-meter resolution and the 2016 Canadian Annual Crop Inventory (ACI) with 71 vegetation and other fields at 30-meter resolution (Zhang and Moran, 2018). Recently, the 2011 Canadian NFI became available, allowing the BELD4 database for Canada to be updated. In this presentation, the updated Canadian BELD4 database will be described and spatial distributions of various vegetation species within Canada from the 2001-NFI-based BELD4 and the 2011-NFI-based BELD4 databases will be compared. The impacts of the updated landuse database on biogenic VOC emissions estimated for a continental air quality modeling grid with 10-km grid spacing will also be discussed and some differences along the international border will be noted.

8:25 – 8:50 am - **Novel Tools for Emissions Inventory Development and Verification -** *Rodger Ames, Colorado State University*

Visual and statistical verification of emissions data are important steps in emissions inventory development. This talk presents a couple novel web-based tools to display and validate emissions inventory data. Figure 1 shows graphics from one such tool using data from EPA’s 2011, 2014 and 2016 emissions inventories. This tool, along with its siblings, has been applied to emissions inventory review and model performance evaluation to support air quality modeling platform development. A few interesting observations gleaned from the review process, and examples that demonstrate the tool’s analytical capabilities, will be presented. Potential applications for this family of tools span support for states, locals and tribes in EI development; emissions inventory validation for projects developing base and future year projections for air quality planning; and potential applications that assimilate high resolution observations and top-down EIs with a goal of improving spatial and temporal surrogates used to develop model ready emission for air quality models.

8:50 – 9:15 am - **Developing a Transparent and Comprehensive Estimate of Upstream Emissions for 2016 -** K*. Borgert, J. Brown, R. Cook,*

*C. Parsons, M. Zawacki, A. Eyth, J. Vukovich U.S. EPA; A. Mittelman, M. Pearlson, T. Thrasher, A. Zubrow U.S. Department of Transportation*

U. S. EPA and the Volpe Center are developing an “upstream” emissions modeling tool that will be used by EPA to quantify the impact of changes in the fuel supply system (extraction and refining of fuel through the gas tank) on emissions of criteria pollutants, air toxics, and greenhouse gases. The modeling approach is comprehensive in that it attempts to characterize both petroleum and biofuel-based pathways, including extraction of feedstock, transport of feedstock, refining of fuels, and the transport of finished fuels. The upstream tool leverages key public data sets, including data from the Energy Information Administration (EIA), the National Emissions Inventory (NEI), and the Greenhouse Gas Reporting Program (GHGRP), and it is built upon the EPA’s Emissions Modeling Framework (EMF). The modeling approach is designed to emphasize transparency and repeatability of results and is extendible to new fuels and to new data sources. The model outputs could provide greater fidelity in terms of spatial resolution and emission processes. If combined with mobile source modeling (e.g. MOVES), it will allow EPA to provide a more comprehensive analysis of how changes to the transportation system will impact the environment.

9:15 – 9:40 am - **CMAQ Emissions Calculator Toolkit –** *A. Eilbert, A. Mittelman, R. Pildes, C. Ho, D. Kall, M. Glaze, and K. Perritt, US Department of Transportation*

The Congestion Mitigation and Air Quality Improvement (CMAQ) Program disburses federal funds to state and local agencies for eligible surface transportation projects that demonstrate emission reductions. The US Department of Transportation has developed a series of spreadsheet-based tools to help project sponsors calculate reliable air quality benefit estimates for CMAQ-funded projects. The CMAQ Emissions Calculator Toolkit currently includes tools for traffic flow improvements, advanced diesel truck technologies, alternative fuel vehicles and infrastructure, carpooling and van pooling, transit bus retrofits and replacements, transit bus service and fleet expansion, idle reduction of long-haul diesel trucks, and most recently bicycle and pedestrian improvements. Development is underway for tools evaluating dust mitigation, managed lane facilities, and some intelligent transportation system projects. Every CMAQ tool goes through a rigorous inter-agency review and beta testing process. For each tool, the Toolkit provides a user guide with calculation methodology and specific project examples as well as documentation of the underlying emissions data. The tools primarily rely on national-scale emission estimates from EPA’s Motor Vehicle Emissions Simulator (MOVES), however users have the option to enter their own local emission rates if desired. The Toolkit is publicly available through the Federal Highway Administration and can be used by any individual or agency evaluating the potential air quality benefits of on-road or non-road projects.

**International Emission Inventory Conference**

**GREENHOUSE GAS/REMOTE SENSING SESSION ABSTRACTS**

**Chairs: Joe Mangino, U.S. EPA, Tammy Manning, North Carolina Dept of Environmental Quality**

**Thursday, August 1, 2019**

*8:00 – 8:25 am -* **Vulcan and Hestia: Quantification of High-Resolution, Bottom-Up Fossil Fuel CO2 Emissions for the Nation and US Cities –**

*K. Gurney, G. Roest, Northern Arizona University; J. Liang, R. Patarasuk, J. Huang, Y. Song, M. Hutchins, Arizona State University; P. Rao, University of Michigan; D. O’Keeffe, Arizona State University; D. Mendoza, Yuyu Zhou, Purdue University*,

Carbon dioxide emissions remain the largest component of greenhouse gas emissions to the Earth’s atmosphere. In order to simultaneously monitor/verify emissions and provide specific emissions mitigation policy guidance, emissions must be quantified in explicit space/time detail at scales relevant to decisionmakers and in usable forms.

We will present the latest results from two large scientific efforts to generate high space/time resolution fossil fuel carbon dioxide (FFCO2) emissions inventories in the US. The first, the Vulcan project has produced an FFCO2 emissions estimation for the entire US landscape to scales of 1 km x 1 km every hour for the years 2010-2015. Built from numerous public datasets, Vulcan includes detail by economic sector, sub-sector, fuel, and emission process. The second project, Hestia, is “nested” within the Vulcan landscape, estimating emissions at the building/street segment scale in individual urban domains. It uses additional datasets retrieved from local urban authorities. Thus far, four US cities have been completed: the Los Angeles Basin, Baltimore, Indianapolis, Salt Lake City with work underway in the Washington DC – Baltimore corridor. The Vulcan and Hestia products demonstrate the spatial and temporal variation in CO2 emissions sources across fuel types and economic sectors. Thus, emissions mitigation policy should be tailored to target region-specific FFCO2 sources.

Both efforts are part of larger multi-institutional efforts integrating the bottom-up Vulcan and Hestia estimates with top-down atmospheric monitoring and modeling to create a science-driven greenhouse gas information system.

*8:25 – 8:50 am -* **EPA's Emissions & Generation Resource Integrated Database (eGRID): Addition of PM Emissions Rates –** *J. Dorn and D. Cooley, Abt Associates, T. Johnson, U.S. EPA*

Electricity generation is the dominant industrial source of air pollutant emissions in the United States today. Whenever you switch on an electrical appliance, chances are you are contributing to air pollution and greenhouse gas emissions. By documenting the environmental attributes of electric power generation, the Emissions & Generation Resource Integrated Database (eGRID) can help consumers, policy analysts and researchers to better understand the relationship between electricity and the environment. eGRID integrates many different federal data sources on power plants and power companies, including, but not limited to data sources from: EPA, the Energy Information Administration (EIA), and the North American Electric Reliability Corporation (NERC). Emissions data from EPA are carefully integrated with generation data from EIA to produce emission rates in pounds per megawatt-hour (lb/MWh), which allows direct comparison of the environmental attributes of electricity generation. eGRID provides a convenient source of data for states implementing policies such as emissions disclosure, output-based emissions standards, and renewable portfolio standards. Historically, eGRID has included emission rates for SO2, NOx, CO2, CH4, and N2O. An improvement planned for eGRID2018 is the addition of PM emission rates.

*8:50 – 9:15 am -* **Development of North Carolina’s GHG Inventory –** *A. Bollman, North Carolina Department of Environmental*

As directed by an Executive Order signed by the Governor in October 2018, the North Carolina Department of Environmental Quality (NC DEQ) developed an inventory of the State’s greenhouse gases (GHG) that tracks historical and projected emissions trends statewide by sector. This inventory will serve as a road-map for identifying sectors/processes with the greatest potential for emissions reductions. To prepare this inventory, NC DEQ generally relied on the methodologies incorporated in the State Inventory and Projection Tool (SIT), which the U.S. Environmental Protection Agency (EPA) developed to support efforts to develop state-level GHG emissions estimates from 1990 to 2030. This presentation will describe the approach that NC DEQ used to develop North Carolina’s GHG inventory, which was released in January 2019, with particular emphasis on areas where North Carolina diverged from EPA’s SIT. The NC DEQ will also highlight key lessons learned during the inventory development effort, areas identified for future improvement, and major findings and results.

*9:15 – 9:40 am -* **Top-down Estimate of Black Carbon Emissions for City Cluster Using Ground Observations: A Case Study in Southern Jiangsu, China -** *Y. Zhao and X. Zhao, University, China*

We combined WRF/CMAQ and ground observations to optimize black carbon (BC) emissions for southern Jiangsu city cluster, a typical developed region of eastern China. With a bottom-up method, the BC emissions in southern Jiangsu were calculated at 27.0 Gg/yr for 2015 (JS-prior). The annual mean concentration of BC at Nanjing University (NJU, a suburban site) was simulated at 3.4 μg/m3, 11% lower than the observed 3.8 μg/m3. In contrast, it was simulated at 3.4 μg/m3 at Jiangsu Provincial Academy of Environmental Science (PAES, an urban site), 36% higher than the observed 2.5 μg/m3. Assuming a near-linear response of BC concentrations to emission changes, we applied a multiple regression model to fit the hourly surface concentrations of BC at the two sites, based on the detailed source contributions to ambient BC levels from brute-force simulation. BC emissions were estimated at 13.4 Gg/yr (JS-posterior), 50% smaller than the bottom-up estimate. Biases between simulations and observations were reduced for most months at the two sites when JSposterior was applied. At PAES, in particular, the simulated annual mean declined to 2.6 μg/m3 and the annual normalized mean error (NME) decreased from 72.0% to 57.6%. Comparison between the top-down estimates derived from different a prior inventory suggested that the limited impact of the a priori inventory on top-down estimate. Through data screening based on simulated wet deposition and satellite derived precipitation, the impact of wet deposition on the multiple regression model was demonstrated moderate, implying the rationality of near linearity assumption between emissions and concentration.

**International Emission Inventory Conference**

**GREENHOUSE GAS/REMOTE SENSING SESSION ABSTRACTS**

**Chairs: Joe Mangino, U.S. EPA, Tammy Manning, North Carolina Dept of Environmental Quality**

**Thursday, August 1, 2019 – Cont’d**

*10:00 – 10:25 am -* **LULUCF Treatment in Top Down Economic Analyses of Climate Change Policies** – *Edson Rodrigo Toledo Neto, Leopoldo Costa, Jr, Goncalves Manfrim, Ministry of Economy, Brazil*

There is no consensus on the treatment of the Land Use, Land Use Change, and Forestry (LULUCF) category in greenhouse gas (GHG) emissions inventories. The present work seeks to qualify the debate by means of a top down analysis of GHG emissions and final energy consumption of the Brazilian economy in 2009, defining the sectors responsible for LULUCF emissions based on the history of land use. We

make the data compatible with the GHG emission inventories and the energy balance with the regrouping of the economic sectors covered by the input-output matrix. This methodology has been widely used in studies of the effects of climate change on the economy, but without accounting LULUCF emissions. Thus, from the Brazilian history of LULUCF, the agricultural and forestry sectors accounted for the direct and indirect emissions of the activity, plus deforestation emissions in 2009 in the Brazilian Biomes. The carbon and energy intensities of the industrial and electricity sectors responded to the 0.65 and 1.09 tCO2eq/US$ thousand and 292.2 and 288.1 toe/US$ millions of value added, respectively, compatible with those found in the literature. The agricultural and forestry sectors was accountable for 8.73 and 46.84 tCO2eq/US$ thousand and 143.8 and 628.7 toe/US$ million. These results demonstrate the dilemma involved in assigning responsibility for LULUCF emissions, which would greatly raise production costs if emissions pricing becomes a public policy to mitigate climate change in Brazil.

*10:25 – 10:50 am -* **Impact of Food Waste Diversion on Landfill Gas and Leachate from Simulated Landfills -** *M. Krause and T. Tolaymat, U.S. EPA*

Food waste has long been a major component of the municipal solid waste (MSW) stream in the United States. Many states have recently established recycling goals or organics management policies that would necessitate the diversion of food waste from landfills to other management schemes such as composting or anaerobic digestion. Food wastes can be heterogenous and chemically complex, affecting landfill environments in unique ways. Food waste has also been understood to degrade relatively quickly, before landfill gas collection infrastructure can be installed, and so most food waste methane is assumed to be emitted. Five lysimeters (laboratory-scale landfills) were constructed with decreasing levels of food waste to simulate a range of scenarios that diverted 0, 25, 50, 75, and 100% food waste from the landfill-bound MSW stream. The objective was to identify the changes to rate and volume of landfill gas generation and the chemical characteristics of leachate (landfill wastewater). Landfills that diverted 100 or 75% of food waste began generating methane the fastest, contradictory to how current models predict landfill methane generation. This was found to be because food wastes contribute volatile fatty acids to MSW, that lowers pH and delays microbial methanogen dominance. Landfill leachate from landfills that diverted 100 or 75% of the food waste also had significantly decreased ammonia levels compared to the other lysimeters, which could reduce wastewater treatment costs. Landfills that prohibit food waste disposal could warrant different Clean Air Act or AP-42 inventory values.

10:50 – 11:15 am -**Better Permits Make Better Emissions Inventories -** *K. Kalim and W. Smith, K2 Environmental Consulting LLC*

Inventories should be as close to actual emissions as possible. But, if the underlying permits are deficient, the submitters of the annual emissions statements cannot make the proper calculations. K2 Environmental Consulting has extensive experience both in reviewing emissions statements and writing the air pollution permits. Most of the discrepancies found in the emissions statements can be traced back to missing or inaccurate data in the permits. The Lightning Talk will present examples of specific aspects of permits which should be checked for completeness and accuracy.

* Permits often account for the worst case. The emissions statement should base emissions on the average of the materials processed throughout the year.
* Methane from natural gas leaks is often counted as VOC, but Methane is an EXEMPT VOC.
* Limestone dust from material handling should have much more TSP than PM-10 and PM-2.5.
* Formaldehyde emissions are VOC, but not included in AP-42 emissions factors for VOC.
* Small natural gas heaters less than 300,000 Btu/hr have an AP-42 emissions factor of 40 lb/MMscf for CO, but a factor of 84 lb/MM scf if between 0.3 and 1.0 MMBtu/hr. Often permits group all Insignificant natural gas heaters together.
* Diesel SO2 emissions are overstated in AP-42 because sulfur in fuel oil has been drastically reduced the past 25 years.

Further examples will be covered. Small changes to air permits will lead to more accurate emissions inventories this year and for years to come.

11:15 – 11:40 am - I**mproving Methane Emission Estimates with Airborne Active Remote Sensing -** *B. Farris, J. Bartholomew, O. Esch, L. Ruppert , C. Weimer, P. Lyman, Ball Aerospace & Technologies Corporation*

Methane emissions originate from a multitude of sources. All methane emissions contribute to rising atmospheric concentrations of this potent greenhouse gas. Since 2013, Ball Aerospace, with partial funding from the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) has been developing integrated path differential absorption (IPDA) LIDAR instrumentation with sufficient resolution and sensitivity to identify and quantify individual methane sources. The instrumentation’s wide area coverage capability allows efficient mapping of emissions from gathering and distribution networks, processing facilities, landfills, natural seeps, agriculture, and other distributed methane sources. This technology can significantly decrease uncertainties in methane emission measurements and help reconcile differences in top-down and bottom-up inventories. This presentation summarizes the benefits of advanced instrumentation for airborne methane emission mapping and reviews results from survey flights over part of the Denver-Julesburg Basin in Colorado and the Los Angeles Basin in California.

**International Emission Inventory Conference**

**GREENHOUSE GAS/REMOTE SENSING SESSION ABSTRACTS**

**Chairs: Joe Mangino, U.S. EPA, Tammy Manning, North Carolina Dept of Environmental Quality**

**Friday, August 2, 2019**

8:00 – 8:25 am - **Magnitude and Trend of NOx Emissions Constrained by OMI Observations and Associated Impacts on Air Quality -**

*Z. Qu and D. Henze, University of Colorado*

Accurate estimates of magnitudes and trends of nitrogen oxides (NOx) emissions are important for understanding formation of air pollutants and the effectiveness of emission control strategies. We estimate long-term global (2° × 2.5° resolution, 2005 -2017) and regional (0.5° × 0.67° resolution, 2005-2012) NOx emissions for East Asia and North America using a newly derived hybrid mass balance / 4D-Var inversion framework by assimilating OMI NO2 observations into the GEOS-Chem adjoint model. NASA standard product and DOMINO retrievals of NO2 column are both used to constrain emissions; comparison of these results provides insight into regions where trends are most robust with respect to retrieval uncertainties, and highlights regions where seemingly significant trends are retrieval-specific. Our top-down NOx emissions in China increase from 2005 to 2011 and start to decrease from 8.0 TgN/ year in 2011 to 7.0 TgN/year in 2015, whereas the reduction of top-down NOx emissions in the US has slowed since 2010. No clear NOx emission trend is observed in Western Europe and Japan. Posterior simulations of NO2 and O3 concentrations are evaluated with surface measurements, where emissions constrained by NASA product lead to smaller bias in both NO2 and daytime O3 concentrations than employing emissions from bottom-up HTAPv2 inventory or the emissions constrained by DOMINO. The simulated O3 trends using top-down NOx emissions are mostly consistent with ambient O3 measurements. We then separate the contributions to trends in O3 driven by NOx emissions versus meteorology, thereby quantifying how remote-sensing based emission estimates refine understanding of air pollution

8:25 – 8:50 am - **Decadal Changes in Global NOx, CO, and SO2 Emissions Derived from Multi-model Multi-constituent Satellite Data Assimilation** *K. Miyazaki, K. Bowman and J. Worden, California Institute of Technology; T. Sekiya, K. Sudo, Y. Kanaya, Japan Agency for Marine-Earth Science and Technology; H. Eskes and K. Folkert Boersma, Royal Netherlands Meteorological Institute (KNMI), De Bilt, the Netherlands; Z. Jiang, University of Science and Technology of China; K. Yumimoto, Kyushu University, Fukuoka, Japan; T. Walker, Carleton University, Canada*

Global surface emissions of NOx, CO, and SO2 for the years 2005–2017 are estimated from an assimilation of multiple satellite datasets: tropospheric NO2 columns from OMI, GOME-2, and SCIAMACHY; CO profiles from MOPITT; SO2 columns from OMI, O3 profiles from TES; and O3 and HNO3 profiles from MLS using an ensemble Kalman filter (EnKF) technique. Chemical concentrations of various species and emission sources of several precursors are simultaneously optimized. This is expected to improve the emission inversion because the emission estimates are influenced by biases in the modelled tropospheric chemistry, which can be partly corrected by also optimizing the concentrations. Some updates have been applied from our previous studies (Miyazaki et al., 2017; Jiang et al., 2018) including horizontal resolution (from 2.8° to 1.1°), assimilated measurements, and data assimilation setting. We present detailed distributions of the estimated emission distributions for all major regions, the diurnal, seasonal, and decadal variability. The importance of forecast model performance for tropospheric chemistry data assimilation is investigated using four chemical transport modeling frameworks (GEOS-Chem, AGCM-CHASER, MIROC-Chem, MIROC-Chem-H) and a common EnKF data assimilation approach. The forecast model performance differed significantly for many species, whereas data assimilation improved the multi-model consistency and agreements with independent measurements. The results demonstrate that the multi-constituent assimilation improves representations of the tropospheric chemistry system including emission estimates, making them less dependent on the characteristics of individual models, while the multi-model discrepancy in a posterior emission could be used to measure the uncertainty of the current top-down emission estimates.

8:50 – 9:15 am - **Broad-Area Emission Surveys with Airborne Remote Sensing –** *D. M. Tratt, K. M. Saad, K. N. Buckland, E. R. Keim, J. L. Hall*

*The Aerospace Corporation; I. Leifer Bubbleology Research International*

The ability to rapidly survey fugitive emissions and their sources over large areas is a capability with relevance across multiple sectors, including regulatory monitoring, mitigation of public health concerns, post-disaster hazard evaluation, and regional climate assessment. Airborne hyperspectral thermal-infrared (7.6-13.2 microns spectral range) imaging is a versatile technique for detecting, identifying, sourcing, and tracking gaseous emissions from compact sources in a variety of scenarios. Hyperspectral resolution enables detection and speciation of multiple gases within the sensor field-of-regard using spectral correlation techniques, while meter-scale spatial resolution permits unambiguous tracking of emissions to their source. Measurements are made using the Mako sensor operating in the 7.6-13.2–micron spectral region (Buckland et al., 2017). This instrument has a maximum areal acquisition rate of 32 km2/minute at a pixel resolution of 2 m. The imagery data are correlated against a ~700-member spectral library to determine the presence of gases within the scene. This contribution will include examples of emissions measurements from agriculture/husbandry operations, oil/gas production and distribution, sources of greenhouse gas (methane, halocarbons), and an array of industrial processes.

**International Emission Inventory Conference**

**INTERNATIONAL INVENTORIES SESSION ABSTRACTS**

**Chairs: Venkatesh Rao, U.S. EPA, Anne Monette, Environment and Climate Change Canada**

**Thursday, August 1, 2019**

8:00 – 8:25 am - **Canada’s Inventory of Facility-Reported Pollutant Releases: The National Pollutant Release Inventory** - Jennifer Underhill

Environment and Climate Change Canada

The National Pollutant Release Inventory (NPRI) is Canada’s public inventory of facility-reported releases, disposals and transfers. It is a key resource for identifying and monitoring sources of pollution in Canada. The NPRI tracks over 320 pollutants from over 7,000 facilities across Canada including mines, oil and gas operations, utilities, sewage treatment plants and other sectors.

All of the data the NPRI collects are publicly available on the NPRI website and the Government of Canada’s Open Data Portal. This poster presentation will include a live demonstration of how to access NPRI data products, including:

* Online query tool to search detailed information on pollutant releases;
* Single year tabular data including the most commonly used data fields;
* Bulk data from 1993-2017 in normalized format for pivot table analyses; and
* Map layers – Virtual Globe (including Google Earth™) and Open Mapping services files.

NPRI data have many uses, including improving public understanding about sources of pollution in Canada, encouraging voluntary action to reduce releases and tracking progress in reducing releases. NPRI data also form the basis of Canada’s comprehensive air emissions inventories, including Canada’s Air Pollutant Emission Inventory and Black Carbon Inventory, which serve as inputs to air quality models and support international reporting obligations.

8:25 – 8:50 am – **Introduction to Canada’s Emissions Inventories –** *D. Smith, B. Taylor, J. Underhill, A. Monette, Environment and Climate Change Canada*

This presentation will provide an overview of Canada’s national air emissions inventories and how they are connected:

* National Pollutant Release Inventory: Canada’s inventory of facility-reported releases of over 300 substances, including criteria air contaminants, hazardous air pollutants and persistent, bio accumulative and toxic substances. The program has collected data from facilities every year since 1993.
* Air Pollutant Emissions Inventory: a comprehensive inventory of emissions of 17 air pollutants at the national and provincial/territorial levels, published annually since 1973.
* Greenhouse Gas Reporting Program: information on greenhouse gas emissions reported by facilities across Canada. The program has collected data from facilities every year since 2004.
* Canada’s Official Greenhouse Gas Inventory: an annual inventory of anthropogenic emissions by sources and removals by sinks at the national and provincial/territorial levels dating back to 1990.
* Black Carbon Inventory: an annual inventory of black carbon emissions that was first published in 2016 with data from 2014 onwards.

8:50 – 9:15 am - **Use of National Emissions Inventory Data for Development of Regulatory Reporting Requirements in Canada -** *A. Monette,*

*Environment and Climate Change Canada*

The National Pollutant Release Inventory is Canada’s inventory of facility-reported releases of over 300 substances. The NPRI is similar in many respects to the United States’ Toxics Release Inventory. Facilities in Canada that meet certain requirements are required to report data on quantities of substances released (to air, water and land), disposed of and recycled to Environment and Climate Change Canada (ECCC). These substances include criteria air contaminants, hazardous air pollutants and persistent, bio accumulative and toxic substances.

The criteria to determine whether a facility is required to report releases to the NPRI are developed through a public consultation process, supported by analyses performed by ECCC. Since Canada does not have a nation-wide, process-level inventory of air emissions from facilities, United States National Emissions Inventory (NEI) data are often used to evaluate potential changes to the Canadian reporting criteria. Analyses of 2014 NEI data are currently being used to propose reporting requirements for seven criteria air contaminants and 65 volatile organic compounds. The proposed changes include requiring more emissions to be allocated to individual stacks and requiring combustion- and process-related emissions to be reported separately.

NPRI data form the basis of Canada’s comprehensive air emissions inventories, including the Air Pollutant Emission Inventory and the Black Carbon Inventory, which then serve as inputs to air quality models. The proposed changes to NPRI reporting requirements are intended to provide more data for use by compilers of comprehensive air emissions inventories and air quality modelers.

**International Emission Inventory Conference**

**INTERNATIONAL INVENTORIES SESSION ABSTRACTS**

**Chairs: Venkatesh Rao, U.S. EPA, Anne Monette, Environment and Climate Change Canada**

**Thursday, August 1, 2019 – Cont’d**

9:15 – 9:40 am - **Using Pollutant Release and Transfer Registers to Support Global Sustainability –** *C. Briere, U.S. EPA*

A Pollutant Release and Transfer Register (PRTR) is a public inventory of chemicals or other pollutants released to air, water, land, or transferred off-site for treatment. While PRTR programs vary by country in terms of chemical and sector coverage, thresholds for reporting, inclusion of point vs. non-point sources, chemical management activities, and sizes of facilities, PRTRs typically require industrial facilities who release chemicals to quantify their releases and report them to their government on a regular basis. Following the devastating chemical accident in Bhopal, India, in 1984, the US passed the Emergency Planning and Community Right-to-know Act in 1986, creating the Toxics Release Inventory (TRI) as the first national PRTR program. In 1992, the UN Conference on Environment and Development affirmed the “right to know” of the public about toxic chemicals and other substances, prompting more countries to develop their own PRTRs. This presentation will discuss a new project being conducted through the OECD Working Group on PRTR, of which the delegate from the TRI Program is a Vice-Chair. This project aims to demonstrate how PRTR data from multiple countries can be used to evaluate progress towards meeting the UN Sustainable Development Goals (SDGs) relating to chemical safety and management. The project combines data from seven PRTR systems for fourteen pollutants released by facilities in the manufacturing sectors around the world. By demonstrating the relevance of PRTR data to the UN SDGs, this project hopes to promote the utility of PRTR data for global-scale analyses in many more ways.

10:00 – 10:25 am - **Annual Vehicle Emissions at U.S.-Mexico Border Crossings** – *J. Koupal, M. Wolf, Eastern Research Group, Inc; E. Melgoza*,

*L. Ramirez, California Air Resources Board*

The California Air Resources Board (CARB) is having ERG review and update emissions estimates for the Mexican border state of Baja California for inclusion in CARB’s 2014 air quality platform.   This work will review current inventories prepared by Mexico air quality agencies, and generate new estimates for agricultural burning, brick kilns and border crossings.   Border crossings have traditionally been underrepresented in vehicle emission inventories but are a growing concern because of the high vehicle crossing volume (nearly 30 million crossings into California in 2014) coupled with long wait time (frequently over an hour) of stop-and-go operation.  To develop a detailed border crossing inventory, the project scale feature of U.S EPA’s MOVES2014a was used to estimate total mass emissions of VOC, CO, NOx, SO2, PM10, PM2.5 and NH3 for the six U.S.-Mexico border crossings in California/Baja California.  The analysis drew on several studies conducted at the U.S.-Mexico border over the past decade but incorporates new data from U.S. Customs & Border Protection on crossing volume and border wait time for specific types of lanes (general vs. expedited) and vehicle types (passenger, commercial truck, bus).  The study accounts for Mexican vehicle emissions with MOVES-Mexico, which reflects significant differences in vehicle emissions between Mexico and the U.S.   Additional analysis was performed to quantify evaporative “running losses” for crossing vehicles, a significant concern since long waits with the engine running will increase the fuel temperatures that drive these emissions, and prior studies suggest highly elevated evaporative emissions from Mexican vehicles.

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**INTERNATIONAL INVENTORIES SESSION ABSTRACTS**

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**Thursday, August 1, 2019 – Cont’d**

10:25 – 10:50 am - **Using International Emissions Inventories for the Validation of Global Life Cycle Assessment Databases –** *C. Mutel, P. Scherrer Instititut, Switzerland*

Life cycle assessment (LCA) is used to support sustainable decision making by companies, regulators, and consumers. LCA normally relies on global databases which describe the emissions associated with each step of an activity, and such databases can be bottom-up (starting with detailed data on individual technologies) or top-down (starting with aggregated economic statistics for whole economies). In either case, there is currently little to no validation to ensure that the global or regional emission totals fit measured levels. In this presentation, I introduce BONSAI, a new open database that is using a disparate set of emission inventories to both better characterize technologies and validate their modeled emissions. This approach has several advantages over the current state-of-the-art:

* By looking at several emission inventories at once, we can identify missing or incorrect LCA
* model assumptions
* Bootstrapping different sources or spatial scales allows us to quantify parameter uncertainties
* The use of independent observations, for example from remote sensing, gives us a first
* quantitative estimate of the global error of LCA models
* By performing all data collection and analysis with open science, a transparent and consensus based
* foundation for sustainability assessment calculations and discussion can be created.
* The data reconciliation approach is illustrated with examples from mobility and agriculture. I
* conclude with concrete steps to better realize synergies between LCA and emission inventories.
* This work was supported by the Swiss National Science Foundation within the framework of the
* national research program sustainable economy' (NRP 73).

10:50 – 11:15 am – **Assessment of Emissions by Road Transport Sector in Azerbaijan -** *H. S. Huseyn, Azerbaijan, M. I. Israfil, M. H..Movajat, Azerbaijan National Academy of Sciences*

The contribution of emissions by road transport sector in Azerbaijan has been evaluated. As a result of conducted surveys, it is ascertained that car wastes are the main pollution sources of worsening air quality in Azerbaijan. Thus, over 80% (1 mln ton) of the total emissions has been exhausted by vehicles. Especially in the cities, (Baku, Ganja, Sumgait, Mingachaur) the amount of exhaust gases is over 80%. COPERT 4 software evaluation program has been applied (Fig. I) to calculate total emissions, including GHG emissions such as carbon dioxide (Fig.3), nitrous oxides and methane which are main source of Global Warming and Climate Changes.

To comply with this, activity data for greenhouse gas emissions from road transport are derived from the Energy Balance. This includes fuel sales of gasoline, diesel, Liquefied Petroleum Gas (LPG). Natural gas (CNG) and biofuels, is not used in Azerbaijan. Fuel sales data in the Energy Balance are not divided according to vehicle categories. For emission assessment, total sales per fuel type are disaggregated to the various road transport subcategories in accordance with their share in total fuel consumption in the Azerbaijan. While the data of vehicle kilometers travelled per type is not conducted and not available therefore we have used the science data of researching in travelling data of vehicles per type. Thus, calculated bottom-up using and the specific fuel consumption per vehicle kilometer.

According to the development of oil industry, number of vehicles lineally have been increased between 2000 and 2017 in Azerbaijan. Thus, the number of registered vehicles was just 0,44 million number in 2000, in 2017 it reached to 1.34 million and continue to go up by 50-80 (6- 8%) thousand per year. Apart from this, the main fuel consumption, especially gasoline, accounts for transportation and reports shows that 1.36 min ton gasoline, 897-thousand-ton diesel fuel and 23 .1 thousand-ton LPG was consumed in 2017.

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**INTERNATIONAL INVENTORIES SESSION ABSTRACTS**

**Chairs: Venkatesh Rao, U.S. EPA, Anne Monette, Environment and Climate Change Canada**

11:15 – 11:40 am – **Emission Inventory by Diesel Locomotives: Evaluating the Economic and Environmental Impacts of Locomotive Renovation Policy for Iran National Railroad Network** - Shahab Dabirinejad1, Amin Moeinaddini2, Meeghat Habibian3\*, Yalda Rahmati4

1,2, 3: Department of Civil and Environmental Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

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Nowadays, a number of Iranian cities are facing major air pollution problems. In several metropolises such as Tehran, Isfahan, and Karaj, Air Quality Index (AQI) is sometimes determined higher than 150 which is reported as extremely unhealthy to dangerous. Old locomotives which are serving intercity rail passengers are the main source of air pollution, especially in such cities’ suburbs. As Iran national railroad locomotives are usually manufactured before 2001, this mode of transportation is responsible for a significant part of emissions in the country. This research is investigating the impact of locomotives renovation policy on air pollution. To address this policy, different scenarios of fleet renovation employed to evaluate both environmental and economic impacts. The studied scenarios include 20, 40, 60 and 80 percent renovation on the passenger and freight fleet locomotives in addition to the current situation. Emissions are determined by using the real demand data derived by Iran’s railroad origin-destination for both passenger and freight trains from March 2018 to June 2018. The emissions including HC, CO, NOx, PM, SO2, and CO2 are calculated, and the results converted to the cost of human health based on using EPA standard for emission factor of locomotives. The result of this paper shows that the renovation of passenger and freight locomotives can significantly reduce the emission as well as maintenance and repair costs.

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**POINT/NONPOINT SESSION ABSTRACTS**

**Chairs: Rich Mason, U.S. EPA; David Cooley, Abt Associates**

**Thursday, August 1, 2019**

10:00 – 10:25 am – **New Approach for 2017 Nonpoint NEI Development –** *R. Mason, J. Snyder, V. Rao, J. Mangino, U.S. EPA; D. Cooley, Abt Associate, Inc.*

The US EPA is in the process of compiling the Nonpoint data category of the 2017 National Emissions Inventory using a new approach where State/Local/Tribal (SLT) inventory developers can submit review and submit activity inputs in addition to, or in-lieu of emission estimates. Previous NEIs have relied on SLTs accepting EPA emission estimates or submitting their own. Now, we’ve developed a process where SLTs can review and comment on the existing methodologies and input data, and choose to accept EPA methods, submit some or all of their own inputs, or generate their own estimates. A new and streamlined Nonpoint Survey is the bridge connecting SLT submission intentions with the resulting Nonpoint NEI. Born out of a Nonpoint LEAN event in 2016, we will discuss the initial identified chokepoints in the Nonpoint inventory development cycle, how the initial and final 2017 development plan shook out and lessons learned as we move forward to the 2020 NEI planning.

10:25 – 10:50 am - **Updates to Industrial, Commercial, and Institutional Emissions Estimation Methods –** *D. Cooley, Abt Associates; R. Mason, U.S.EPA*

The U.S. EPA has developed tools to estimate emissions from the industrial, commercial, and institutional (ICI) fuel combustion sectors. However, these emission estimates must be adjusted to account for emissions reported by point sources to avoid double counting. This presentation will discuss an update to the method for estimating these emissions, including by mapping point source facilities into the appropriate sectors using NAICS codes rather than SCCs, and using data from the EIA form 923 to identify point sources that are considered electric generating units. The revisions to the ICI tool are being used to improve the emission estimates for the 2017 National Emissions Inventory.

10:50 – 11:15 am - **Updates on Residential Wood Combustion Surveys *–*** *C. Y. Wu, H. Field, M. Kuhl-Stennes, A. Jackson, A. Kovacevic, M. J. Fenske, K. Palmer Minnesota Pollution Control Agency*

Residential wood combustion (RWC) is a significant source of air pollution in the United States. RWC always draws a lot of attention in the preparation of emission inventory for nonpoint sources due to its importance and complexity. Estimating RWC emissions involves quantification of multiple appliances, such as fire pits, fireplaces, woodstoves, and hydronic heaters, and multiple fuels, such as wood, wax logs, and wood pellets. Those appliances can be manufactured in various types, for example, a woodstove in freestanding or an insert, with a catalyst or be without. Each appliance/fuel potentially has its specific emission character. RWC’s ubiquitous nature makes it impossible to characterize each RWC individually. In order to collect more representative activity data, Minnesota has conducted surveys of residential wood burning for five decades. The surveys have evolved and improved with time. The most current survey was conducted for the 2017-2018 heating season.

Compared with the upward trend observed in the 2014-2015 survey, the current survey showed a reduction in wood consumption from 2.13 to 1.45 million cords. This is slightly higher than the value from the 2011-2012 survey, 1.27 million cords. Wood consumption (by weight) in outdoor wood burning fire pits, chimeneas or fire rings is a significant type of RWC, it increased from 24.6 % in the 2014-2015 to 27.9% during the 2017-2018 heating seasons, becoming the top wood burning activity in the state. Outdoor hydronic heater consumed 23.8% and 25.0 % of all wood burned (by weight) in the current and the last surveys, respectively.

11:15 – 11:40 am - **A New Auto Body Refinishing Emission Factor Created from Statewide Industry Surveys –** *S. G. Cone, G. Dossett, Delaware Department of Natural Resources and Environmental Control*

Delaware Division of Air Quality has created a bottom-up, high resolution emission inventory for the auto body refinishing industry in the state. The inventory directly surveyed industry, and in 2014, we had a response rate exceeding 90%. We have had continued annual data submissions from industry each year since. We believe we have a nearly complete view of actual product use in our state, as the surveyed members of industry reported their purchases of painting products. These reports were often supplied by the refinishing product suppliers and included gallons of product and pounds of volatile organic compound (VOC) per gallon for each product. For this reason, we have high confidence in the accuracy and completeness of the records. The Division also has access to Department of Labor records for the state. Using this dataset in combination with the VOC reports, we were able to create emission factors based on the number of employees at each facility, by NAICS code. The difficulties of creating a representative emission factor, even with such high-quality data, will be discussed. For instance, car dealerships may perform auto body refinishing, however, they have a large number of employees that are not involved in the refinishing activities.

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**POINT/NONPOINT SESSION ABSTRACTS**

**Chairs: Rich Mason, U.S. EPA; David Cooley, Abt Associates**

**Friday, August 2, 2019**

8:00 – 8:25 am - **Fertilizer NH3 Emission Estimates for 2017 National Emissions Inventory Using an Agricultural Ecosystem Model and an Air Quality Model -** *J. O. Bash, V. Rao, D. Schwede, P. Campbell, T. Spero, W. Appel, U.S. EPA*

The Community Multiscale Air Quality (CMAQ) model v5.3 includes a new land use specific dry deposition scheme that has been developed to improve linkages with ecosystem models and to estimate fertilizer NH3 emissions when coupled to the USDA’s Environmental Policy Integrated Climate model (EPIC). A model resistance framework that parameterizes air-surface exchange as a gradient process and is consistent between bidirectional exchange and dry deposition will be introduced. NH3 fluxes and ambient concentrations will be evaluated against field scale measurements and ambient NH3 measurements from monitoring networks and satellite observations respectively. CMAQ v5.3 model estimates of NH3 emissions from fertilizer will be evaluated against 2014 and 2011 U.S. EPA NEI estimates. The seasonality and annual emission factors of NH3 emissions estimated in this modeling system will be discussed. Preliminary results from this modeling system indicate that these new parameterizations can capture the magnitude of measured ammonia fluxes well however annual ambient concentrations when simulated with CMAQ are lower than observations. The limitations of using nutrient demands from a plant growth model in EPIC will be discussed. Techniques to reduce these limitations by using USDA survey and state submitted data to modify CMAQ inputs will be presented.

8:25 – 8:50 am - **Methodology for Estimating US Livestock Populations for Use in National Emissions Inventory Development *–*** *J. Mangino,*

*J. Steller, U.S. EPA; K. Edquist, Eastern Research Group, Inc*

Air emissions from livestock populations and corresponding manure management are an important component of agricultural sector emissions inventories in the US. These inventories estimate GHGs and other pollutant emissions, such as ammonia. For example, livestock manure management practices are responsible for approximately 10% of methane emissions according to the EPA’s *Inventory of U.S. Greenhouse Gas Emissions and Sinks*: *1990-2016* (GHG Inventory) and approximately 60% of ammonia emissions according to the EPA’s National Emissions Inventory (NEI). A key input variable to the emission inventories is national livestock populations, which includes various animal types (e.g., beef and dairy cattle, swine, poultry, sheep and other categories). GHG Inventory development is based on livestock population estimation methodologies that utilize information from US Department of Agriculture (USDA), including national statistical databases and census data. EPA has used and refined these methodologies within the annual US GHG Inventory for over 15 years and recently applied these methodologies to the NEI as well. As part of these GHG Inventory population methodologies, EPA processes the USDA population data with models (e.g., Cattle Enteric Fermentation Model for beef and dairy cattle) or other data analysis tools to prepare livestock population estimates that are used with accepted emission estimation methodologies to produce national emissions estimates. In addition, EPA incorporated spatial allocation refinements at the county-level to prepare livestock management county emission estimates for the NEI.

8:50 – 9:15 am - **Data-Driven Modeling of Spatially Explicit Air Pollutant Inventories for Agricultural and Forestry Feedstock Production –**

*R. Hanes, D. Hettinger, D. Inman, and G. Heath, Strategic Energy Analysis Center, National Renewable Energy Laboratory*

As biomass feedstock production expands, air pollutants generated from feedstock supply chain activities may impact air quality and human health. The National Renewable Energy Laboratory’s Feedstock Production Emissions to Air Model (FPEAM) generates county-scale inventories of direct air pollutant emissions produced by feedstock supply chain activities. FPEAM can also be used to generate local, temporally resolved inventories for input into air quality models. This presentation provides an overview of FPEAM functionality and discusses several recent use cases prior to FPEAM’s scheduled public release in September 2019.

FPEAM is a modular, data-driven model. Each module contains calculations for an activity type, except for the feedstock transportation and on-farm equipment operation modules which connect to the U.S. Environmental Protection Agency’s Motor Vehicle Emissions Simulator (MOVES) and Nonroad models, respectively. The data-driven aspect of FPEAM means that it is the input data provided for a scenario rather than the model itself that determines the pollutants and supply chain activities included in the scenario scope. Modules within FPEAM can also be turned on or off manually to adjust the scenario scope. Default input data packaged with the FPEAM code base can be used to calculate inventories of volatile organic compounds, particulate matter, ammonia, nitrogen oxides, sulfur oxides, and carbon monoxide generated by agricultural and forestry equipment operation, application of nitrogenous fertilizers, herbicide and insecticide, and feedstock transportation. Custom, user-developed data can be used in place of the default data to analyze scenarios with additional or alternate feedstocks, pollutants, and supply chain activities.

**International Emission Inventory Conference**

**POINT/NONPOINT SESSION ABSTRACTS**

**Chairs: Rich Mason, U.S. EPA; David Cooley, Abt Associates**

**Friday, August 2, 2019 – Cont’d**

9:15 – 9:40 am - **Characterizing the Impact of Poultry and Cattle Farms on Chesapeake Bay Aerosols in Baltimore, MD During the OWLETS-2 Campaign -** *N. Balasus, University of Maryland*

This study investigated the impact of livestock farms in relative proximity to the Chesapeake Bay on aerosol composition, acidity, and liquid water content during the OWLETS-2 (Ozone Water-Land Environmental Transition Study) campaign. Measurements of inorganic PM2.5 composition, gas-phase ammonia, and an array of meteorological components were undertaken at the Hart-Miller Island supersite, which lies east of Baltimore on the Chesapeake Bay. The location of the measurement site was important for multiple reasons, primarily its proximity to cattle and poultry farms but also the influence of the bay as a source/sink of gases and the potential to induce bay-breeze circulations. During this study, multiple spikes in concentration of particle-phase nitrate and gas-phase ammonia were observed and associated with potentially agricultural sources, including poultry farms on the eastern shore of Maryland and cattle farms in southeastern Pennsylvania. Sources were identified through a combination of HYSPLIT back trajectories, onsite Wind LIDAR measurements, and onsite surface wind measurements. As a result of these agricultural sources and the nearby Chesapeake Bay, the median aerosol pH for this study was 2.31, which was higher (less acidic) than the median aerosol pH predicted for a site in downtown Baltimore during the summer (1.27). Additionally, pH and aerosol liquid water did not exhibit strong diurnal variations, in contrast to other sites in the eastern U.S. during the summer. These results suggest a strong influence of the Chesapeake Bay and surrounding agricultural activity on aerosol chemistry.

10:00 – 10:25 am - **Analysis and Use of Point Source Emission Rates from the National Emissions Inventory -** *M. R. Houyoux, J. Mangino, L. Sutton U.S. EPA*

Stationary source emission rates from the National Emissions Inventory (NEI) are a previously untapped resource for inventory developers. This study examines emission rates in the NEI that are derived from source measurements and that in many cases are not available in other databases. These data can be leveraged to quality assure emissions inventories and to fill gaps in the emission factors information available from other sources. These data can also be compared to existing emission factors to provide context for published emission factors as compared to source test data. This work examines and summarizes the available emission rate data for key pollutants and source categories for which emission factors data is missing, very limited, or low quality. Results will be presented in comparison to EPA emission factors. The results include alternative estimates of particulate and hazardous air pollutant emissions that have been developed by scaling criteria air pollutants using ratios developed from the source emission rates data.

10:25 – 10:50 am - **Rural Tribal Alaska Emissions Inventory: Building A Community Centric Approach to Defining CAP and GHG Emissions –**

*M. Birnbaum and P. Goodfellow, Alaska Department of Environmental Conservation*

In 2018, Pedro Bay (Population: 40) committed under its Indian Environmental General Assistance Program (IGAP) program to develop a greenhouse gas (GHG) emission inventory and Climate Action Plan. The Alaska Department of Environmental Conservation, Division of Air Quality (ADEC) worked with the community Environmental Officer and others in community government to inventory residential, government and commercial operations for NEI submittal and Climate Action Planning.

GHG emissions were calculated by using the EPA Tribal Greenhouse Gas Inventory Tool. Some aspects of the tool were not applicable to Alaska, i.e. water use, agriculture), and some assumptions were made to reflect native villages in rural Alaska.

While this data is not completely reflective of all activities that would generate air emissions within a community boundary, it was enough to generate reliable figures to measure annual community emissions.

Challenges occurred when defining transportation activities that rely on air and barge traffic. Data showed conclusively that in small rural communities in Alaska not connected to a road system, household emissions (both CAP and GHG), and particularly transportation emissions, far outweighed government emissions, i.e. power generation. These emissions also outweighed wood combustion for fall and winter heating, as well as wood-fired saunas and smokehouses for subsistence activities. In Pedro Bay, the community replaced all its wood stoves with EPA certified stoves – because they were more efficient in combustion. In reviewing GHG emissions and carbon stocks, Pedro Bay’s undeveloped area land mass sequestered all the GHG emissions produced in the community.

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**International Emission Inventory Conference**

**POINT/NONPOINT SESSION ABSTRACTS**

**Chairs: Rich Mason, U.S. EPA; David Cooley, Abt Associates**

**Friday, August 2, 2019 – Cont’d**

10:50 – 11:15 am - **Alaska Localization of EPA Emissions Data: QA/QC Checks for EPA NEI Data Based on Unique Regional Characteristics** -

*P. Goodfellow, Alaska Department of Environmental Conservation*

As part of ADEC’s responsibilities to participate in the triennial National Emissions Inventory (NEI), DEC personnel reviewed EPA’s modelled emissions data based on population size characteristics of the continental United States. Because of Alaska’s unique geography and infrastructure arrangements, ADEC reviewed 2016 modelling and NEI 2017 data from a practical sense viewpoint and understand how the agency could identify future projects with the aim of assisting EPA in developing better datasets. The EPA provided inventories, including information on long haul-truck hoteling, and non-road commercial operations (loggings, railroad and agriculture operations), which were inspected by DEC personnel along with outside contractors, comparing activity locations to known infrastructure, local conditions, and whether the community was located on the road/rail system. As a result, ADEC was able to identify several shortcomings of EPA’s generic datasets. EPA’s datasets had semi-truck hoteling occurring in locations, such as rural Southwest Alaska, without road access and with limited port facilities where long-haul trucks would not be hoteling. In addition, we identified instances of logging occurring in areas with no logging industry because of a lack of trees or in agriculture data where no agriculture existed. Lastly, in the case of railroad maintenance we found instances where EPA had allocated railyard emissions data in counties that had no rail operations. Through these findings, ADEC will be able to identify projects to better define its emissions and work with the EPA on more effective modeling for Alaska. These findings should also assist DEC in our Regional Haze modeling, as we begin working on SIP writing.

**International Emission Inventory Conference**

**TOXICS/SPECIATION SESSION ABSTRACTS**

**Chairs Madeleine Strum and Steffanie Griffin, U.S. EPA**

**Friday, August 2, 2019**

8:00 – 8:25 am - **Improvements to EPA’s SPECIATE Database: SPECIATE5.0 -** *M. Strum, M. Menetrez, U.S.EPA; F. Divita, Y. Hsu, Abt Associates*

SPECIATE is a repository of speciation profiles that provide composition data for the volatile organic gas and particulate matter emission sources. These data provide the necessary inputs for photochemical air quality models, and for estimating black carbon inventories, and they may also be used in source apportionment and estimation of air toxics emissions.

EPA updates the SPECIATE database every 2-3 years. The most recent update produced SPECIATE 5.0. This update appends over 400 speciation profiles to the previous version (SPECIATE4.5). In addition to adding PM and VOC composition data, EPA has improved the database structure, and has developed a new browser tool using Qlik software to view and access profiles. EPA is also providing workbooks that include calculations made to convert the raw data into speciation profiles.

This presentation will highlight the updates made for SPECIATE 5.0 and will focus on the browser.

8:25 – 8:50 am - **Impact of Wildland Fire Combustion Phase on PM and VOC Speciation and EPA’s National Emissions Inventory –** *A. Holder,*

*I. George, and V. Rao, U.S. EPA*

The National Emissions Inventory (NEI) for Wildland fires relies on the BlueSky Model (BSM) for the estimation process. The BSM is a modular framework developed by the U.S. Forest Service, which combines meteorological models with estimates of fuel loadings, fuel consumption, and emission factors to provide day specific emissions by combustion phase (flaming, smoldering, and residual smoldering). The bulk PM and VOC emission factors used in the current version of the BSM are outdated and do not provide adequate information on how different fuel types and fire conditions impact pollutant emissions. In this work, combined field and laboratory fire simulations were used to fill in gaps in our understanding of the effect of fuels and fire behavior on emissions. Additionally, the composition of PM and VOC emissions from smoldering and flaming phases for each fuel type was measured to address the scant amount of data in the literature on emissions composition from differing combustion phases. Initial results from this study will be shown and the potential impacts to the NEI wildland fire emissions estimates will be discussed.

8:50 – 9:15 am - **Lessons Learned: Creating an Air Toxics Emissions Reporting Program for Oregon -** *B. Albertson, Oregon Department of Environmental Quality*

Emission inventories are only as good as the data used to develop them. Therefore, data collection is a very important aspect to develop emission inventories, especially to answer questions accurately and implement environmental programs effectively. Governor Brown launched the Cleaner Air Oregon Program in April 2016 and tasked Oregon Department of Environmental Quality and Oregon Health Authority to develop rules for a new air toxic permitting program. Oregon did not require air toxics reporting at the time and had no current statewide air toxic emissions inventory. The agencies quickly realized the need for a comprehensive inventory and initiated an emissions reporting program later that year to collect 2016 air toxics data from air permitted facilities throughout the state.

The statewide inventory identified what is emitted, how much, and by whom. The agencies currently use the inventory as a screening tool to identify 1) areas of concern, 2) industrial facilities to call into the new permitting program, and 3) the effectiveness of the permitting program to reduce air toxic emissions throughout the state.

The purpose of this presentation is to share “lessons learned” and provide a different perspective to data collection. The presentation will discuss various components of reporting program development such as:

* identifying facilities for reporting,
* establishing data requirements for reporting,
* choosing suitable emission factors and estimation methodologies for use, and
* data quality issues discovered during QA/QC process.

It will present issues encountered along the way and identify what to do differently to collect good quality data for future inventories.

9:15 – 9:40 am - **Overview of the 2014 National Air Toxics Assessment (NATA)** *T. Palma, M. Strum, D. Smith, M. Morris, A. Eyth, J. Thurman,*

*S. Phillips, M. Woody, R. Cook U.S. EPA,*

The National Air Toxics Assessment (NATA) is EPA’s state-of-the-science screening tool used to help evaluate potential human health risks posed by toxic air pollutants across the United States. This presentation describes the most recent version, the 2014 NATA, which is based on emissions for the year 2014. We present the approach, provide an overview of some of the important results, and discuss potential uses and limitations of NATA. Unlike the Agency’s criteria pollutant program, where ambient monitors are located throughout the country, air toxic monitoring coverage is less extensive. Many air toxics are measured at only a few locations, and for some pollutants, detection limits are too high to evaluate health risk levels of concern. The sparse air toxic monitoring network leaves many potential hot spots and areas of concern that are not well characterized. A key tool EPA uses to predict ambient and exposure concentrations, as well as to estimate health effect risks associated with emissions of air toxics, is NATA. The 2014 NATA uses emissions data from the 2014 National Emissions Inventory as inputs for modeling ambient air concentrations, exposure concentrations and health risk estimates. Results from the analysis include estimates at the census tract of ambient and exposure concentrations as well as estimates of cancer risks and potential noncancer health effects associated with chronic inhalation exposure to air toxics. In the 2014 NATA, national average cancer risks are estimated to be 30-in-1 million. Further, approximately 100 census tracts in 19 urban areas (and 470,000 people) with estimated cancer risks greater than 100-in-1 million.

**International Emission Inventory Conference**

**TOXICS/SPECIATION SESSION ABSTRACTS**

**Chairs Madeleine Strum and Steffanie Griffin, U.S. EPA**

**Friday, August 2, 2019 – Cont’d**

10:00 – 10:25 am **- Polychlorinated Biphenyl (PCBs) Levels and Ecological Risk Assessment in Ambient Air of an Urban Environment with Intensive Gas Flare**. - *S.A Uzoekwe, U. Anekwe. and V. Omoba****,*** *Federal University Otuoke, Federal University Otuoke, Bayelsa State Nigeria.*

Polychlorinated biphenyl (PCBs) are ‘persistent organic pollutant ‘(POP), with unique properties such as extreme stability, chemical inertness, resistant to heat, high dielectric constant and therefore good insulator. Levels and distribution of three major group of PCBs congeners in

ambient air of an urban town of Yenagoa and its environment located in Niger delta area of Nigeria were investigate using gas chromatography (Shimadzu, 2010). The distribution of the congeners according to chlorine substitution mainly classified as mono-ortho, di-ortho and non-ortho showed a s0i.g0n1i3fiμcagnkgt -1v; a0r.i a0t0io1n - f0ro.0m18 μognkeg -location to the other. The congeners ranged between 0.001 - 1 and 0.001 - 0.014μgkg-1 for mono-ortho, non-ortho and di-ortho chlorine substituted PCBs respectively. The study recorded dominance of di-ortho substituted

chlorine and 5-7chlorinated substituted PCBs homologue. The total Σ 20 pCBs concentrations (monoortho, non-ortho and di-ortho) ranged from 0.023 - 0.109μgkg-1 measured at a Palm Plantation (AQBP) used as a control and an industrial site (AQGU) respectively. Generally, all the congeners

were found to be present in trace amounts. The results of multivariate analysis showed that two main factors (gas flaring and industrial activities) were responsible for PCBs concentrations at various locations. Similarly, two clusters (AQBP) and others were identified, suggesting the influence

of two sources to the concentrations measured. The evaluation of ecotoxicological risk of dioxine -like PCBs in ambient air of the studied area and the cancer risk for the inhabitants were found to be low.

10:25 – 10:50 aM - **Tracking Mercury Emissions from Products as Part of Canada’s Air Pollutant Emission Inventory –** *B. G. Sullivan and D. Smith, Waste, Mining and Diffuse Sources, Environment and Climate Change Canada*

Canada Environment and Climate Change Canada (ECCC) annually reports trends in emissions of air pollutants through the Air Pollutant Emission Inventory (APEI). The APEI is intended to be comprehensive and covers many different air emissions sources in Canada. Tracking emissions of mercury from products is particularly challenging; yet it is a high priority because of the severe toxicity of mercury. A life cycle analysis approach is used for estimating mercury emissions from products which considers releases from manufacture, sales, in-service, breakage, disposal, recycling, transportation of items to disposal, disposal point, and the ultimate fate of the contained mercury. The most recent changes to the model have focused on updating emissions from 2009 and onward. This includes using more Canadian data and providing a better reflection of the current Canadian conditions including the impact of restrictions in manufacturing and importing for mercury containing products as well as enhanced recovery and recycling. The presentation will include a background on the Air Pollutant Emissions Inventory; a description of how emissions from mercury in products are estimated and reported; an overview of the recent updates to the model, reconciliation for mercury emissions with other sources in the APEI inventory along with possible future research areas for this sector.

10:50 – 11:15 aM - **What’s Available Through Toxics Release Inventory Data? -** *S. Griffin, U. S. EPA*

The Toxics Release Inventory (TRI) is an annual public database of chemical releases to the environment and other waste management activities from facilities within certain industrial sectors. TRI was established under the Emergency Planning and Community Right-to-Know Act and has provided information on chemical releases and pollution prevention activities at facilities to a wide variety of stakeholders: communities; local, state, and tribal governments; researchers; industry; and other federal environmental programs. Additionally, the TRI program incorporates TRI data into a suite of public online tools, designed for different research or data purposes and geared towards different audiences. This presentation will provide an overview of the TRI program and the data available through TRI. Because TRI data can be used for many different purposes, this presentation will showcase some examples of how various stakeholders use TRI data: promoting successful source reduction activities at facilities, providing TRI outreach to tribal communities, and using TRI releases and toxicity data to model risk. Additionally, participants will be introduced to some of the tools designed for the analysis and presentation of TRI data, including the Risk-Screening Environmental Indicators (RSEI), Pollution Prevention (P2) tool, and TRI Tribal Search Interface.

11:15 – 11:40 am - **How Toxics Release Inventory Data Have Been Used by Academics and Researchers –** *C. Briere, U.S. EPA*

The Toxics Release Inventory (TRI) is an annually-released, publicly-available dataset through which data users can obtain information on how chemical waste is managed at industrial facilities across the United States. TRI was established in 1986 by the Emergency Planning and Community Right-to-know Act, which required EPA to provide the public with information on toxic chemicals released to the environment by industrial facilities in their neighborhoods. TRI has grown to include more chemicals and industrial sectors, and in addition to providing data on chemical releases to the environment, TRI also contains information on how facilities manage chemical waste through recycling, treatment, and incineration, as well as information about pollution prevention efforts that facilities undertake to reduce or eliminate their use of toxic chemicals. This presentation will discuss how TRI data have been used by academics and other researchers in pursuit of various analytical objectives and project outcomes. Some of the projects discussed were conducted in collaboration with TRI staff as part of the TRI University Challenge, while other research was done independently and shared with the TRI Program later. TRI data have been used in a wide variety of fields of research, including chemistry, public health, environmental science, public policy, and economics. The objective of this presentation is to provide an overview of the multitude of ways that TRI data have been used in research projects, and how that research can help us improve access to the data and associated resources.

**International Emission Inventory Conference**

**FIRES AND BIOMASS BURNING SESSION ABSTRACTS**

**Chairs Jeff Vukovich and Joseph Wilkins, U.S. EPA**

**Friday, August 2, 2019**

10:00 – 10:25 am - **New Developments with the Fire INventory from NCAR (FINN) Emissions Model -** *E. McDonald-Buller and Y. Kimura, The University of Texas at Austin; C. Wiedinmyer and M. Joseph, University of Colorado Boulder*

Wildland fires and prescribed burning are sources of atmospheric pollutants that can affect atmospheric chemistry, climate, visibility, and human health. Fire emissions are often transported over multiple spatial scales, ranging from local to intercontinental, and can contribute to exceedances of air quality standards. The Fire INventory from NCAR (FINN) is a global fire emissions model that estimates daily emissions of trace gases and particles from the open burning of biomass. Versions 1.x have been widely used to obtain estimates of emissions from fire events for global and regional atmospheric modeling. The objectives of the current work have been to leverage new findings and data products from recent laboratory studies, field measurement campaigns, and satellite-based sensors in the development of the next generation of the FINN model (FINN version 2), which will offer model improvements and accessible software for community users. The new FINNv2 is being used to develop fire emissions estimates for recent years (2012-2017) relevant to air quality modeling and planning activities in the United States. The features of the next generation model relative to previous versions will be highlighted along with emissions estimates for different global geographic regions. A multi-year summary of fire emissions in the United States will be provided.

10:25 – 10:50 am - **Performance Assessment of Five Inventory from the National Center for Atmospheric Research (FINNv2) W wildfire Emissions Estimates Using Satellite Aerosol Observations** – *N. Pavlovic, S. Brown, F. Lurmann, Sonoma Technology, Inc; Y. Kimura, E. McDonald-Buller, The University of Texas at Austin; C. Wiedinmyer, University of Colorado Boulder*

Wildland fires and open burning can be substantial sources of ozone precursors and particulate matter. Air quality can be affected by fire events that occur locally, regionally, or across the United States and even beyond its international borders. The Fire Inventory from the National Center for Atmospheric Research (FINN) model estimates daily global emissions of trace gases and particles from open biomass burning. FINN was enhanced using new findings and data products from ongoing laboratory studies, surface and airborne field measurement campaigns, and satellite-based sensors to produce a fully operational, next-generation global FINN application (FINNv2). Fire emissions estimates for 2012-2017—a time that includes recent years relevant to air quality modeling and planning activities in the United States have been developed using FINNv2. In this presentation, we discuss preliminary results from a performance assessment of FINNv2 using aerosol optical depth retrievals from the Multi-Angle Implementation of Atmospheric Correction (MAIAC) applied to Moderate Resolution Imaging Spectroradiometer (MODIS) imagery. Our assessment focuses on fire events that (1) originate from within Mexico, Central America, or the Caribbean, and (2) influence air quality in the southern United States. With FINNv2 emissions inputs, we use HYSPLIT dispersion modeling and Comprehensive Air Quality Model with Extensions (CAMx) photochemical model output to compare aerosol optical depth with smoke observations in 2012-2017. We assess agreement between model output and satellite observations of AOD using a variety of accuracy metrics to understand the performance characteristics of the FINNv2 emissions estimates.

10:50 – 11:15 am - **Development and Evaluation of Wildland Fire EI’s for Regional Haze Planning -** *M. Mavko and E. Burgess, Air Sciences Inc*.

The Western Regional Air Partnership is assisting Western states and tribes with a second round of air quality planning to evaluate ongoing reasonable progress on achieving the long-term goals of the Regional Haze Rule. A key part of the planning process is evaluating current conditions and building scenarios to estimate ranges of possible future conditions expected by 2028 for the current planning cycle, at IMPROVE monitoring stations using photochemical grid modeling (PGM). Wildland fire is a major contributor to haze-causing emissions and among the most difficult to assess.

We will discuss the process of building a non-year specific fire emissions inventory framework for wild, prescribed, and agricultural fire to construct current (baseline) and future conditions. We will outline a scenario planning process used to develop possible future outcomes, as well as the statistical techniques used to develop a probability-driven approach to inventory development. Results, implications, and limitations of scenario results will be discussed.

11:15 – 11:40 am - **Exploring the Vertical Distribution of Wildland Fire Smoke in CMAQ -** *J. Wilkins, G. Pouliot, T. Pierce, U.S. EPA; J. Beidler, General Dynamics IT*

The area burned by wildland fires (prescribed and wild) across the contiguous United States has expanded by nearly 50% over the past 20 years, now averaging 5 million ha per year. Chemical transport models are used by environmental decision makers to both examine the impact of air pollution on human health and to devise strategies for reducing or mitigating exposure of humans to harmful levels of air pollution. Since wildfires are increasing in size and burning more intensely, the exposure of humans to fine particulate matter (PM2.5) and ozone (O3) is projected to grow. Currently, there is little consensus on fire pollution vertical transport methods. The height to which a biomass burning plume is injected into the atmosphere, or plume rise, is not only difficult to qualitatively determine, but also comes with quantitative difficulties due to poor understanding of physical constraints within models. Many air quality models rely on plume rise algorithms to determine vertical allocation of emissions. Using various input models or in-line plume height calculations, these algorithms determine plume height vertical structures and invoke transport of emissions. In this work, we test basic plume rise methods currently being used in chemical transport modeling in order to determine where the Community Multiscale Air Quality (CMAQ) modeling system’s current capabilities can be improved. We investigate proposed improvements for allocating the vertical distribution of smoke by separately characterizing the impacts of model grid resolution, emissions temporal profile, and plume rise algorithm.