Coordinating Research Council, Inc.

AGENDA

35th CRC REAL WORLD EMISSIONS WORKSHOP

Co-Sponsors

California Air Resources Board
South Coast Air Quality Management District
National Renewable Energy Laboratory

Workshop Organizers

Paul Loeper, Chevron (Co-Chair)
Michael Moore, Stellantis (Co-Chair)
Matthew Sheehan, Chevron (Co-Chair)
Michael Aldridge, US Environmental Protection Agency
Sam Cao, South Coast Air Quality Management District
Yusuf Khan, Cummins Inc.
Andrew Kotz, National Renewable Energy Laboratory
Joseph Martin, US Environmental Protection Agency
Rada Purushothaman, Caterpillar
Heidi Vreeland, US Environmental Protection Agency
Laxmi Reddy Yatavelli, California Air Resources Board
Seungju Yoon, California Air Resources Board

Marriott Long Beach Downtown
April 13-16, 2025

The purpose of this workshop is free exchange of ideas, research, data, etc. Please do not record or take photos of presentations. All submitted presentation content will be available to participants in the Workshop Proceedings. Sponsorship of or participation in the workshop by CRC or others does not reflect any endorsement of information.

rev. 4.7.25

Keynote Speakers

Kent Hoekman

Research Professor Emeritus
Desert Research Institute

S. Kent Hoekman is a Research Professor, Emeritus within the Division of Atmospheric Sciences at the Desert Research Institute (DRI). DRI is a statewide division of the Nevada System of Higher Education (NSHE) that pursues basic and applied environmental research on local, national, and international scales.

Dr. Hoekman joined DRI in 2001 and served as Executive Director of the Division of Atmospheric Sciences until 2007. He then established his own research program in areas related to biofuels, renewable energy systems, vehicle emissions, air quality, and lifecycle assessments.

Prior to joining DRI, Dr. Hoekman spent over 20 years at Chevron, where his work focused on technical and regulatory issues pertaining to transportation fuels, mobile source emissions, emission controls, vehicle technology, and urban air quality.

For over 40 years, Dr. Hoekman has been involved with CRC and its activities. He holds a B.S degree in Chemistry from Calvin University, and a Ph.D. in Organic Chemistry from Iowa State University.

Wayne Miller

Recalled Researcher
University of California, Riverside

At UCR, his research on emission properties from internal and external combustion sources has involved a wide range of sources, including stationary sources, wildland fires, automobiles, trucks, buses, locomotives, military diesel equipment, construction equipment, aircraft, ground support equipment, harbor craft, cargo handling equipment, and ocean-going vessels. The research has provided new insight into these sources' physical and chemical characterization and is often the first-ever data on real-world use. The research studied control technology, including new engine design, the use of cleaner-burning fuels, and systems with controls added to the exhaust. For example, current research on fuels involves renewable and low-carbon fuels. Projects that investigated the release and characterization of combustion and emissions from wildland fires, especially the nature of the particulate emissions, are often cited. The research projects are academically collaborative and designed to cross government and industry lines to stretch students’ experience beyond the theories learned in the classroom. The research findings are in the technical support documents for several federal and California regulations.

Workshop Co-Chairs

Michael Moore

Stellantis

Michael Moore is a Senior Regulatory Development Engineer of the Environmental and Energy Regulatory Development Group for Stellantis N.V. In his current role, Michael is the global fuels and evaporative emissions regulatory lead for Stellantis. In addition, Michael and the Regulatory Development Group responds to all North American environmental rulemakings. This includes interaction with government, industry, and third-party entities to develop and promote rational market-based regulations. Michael received his Bachelor of Science from Michigan State University and holds a Master of Science from Eastern Michigan University.

Paul Loeper

Chevron

Paul Loeper is a Fuels Engineer for Chevron, performing fuels and additive research within the Fuel Products & Technology group at the Richmond Technical Center (RTC). Paul participates in a number of industry groups working to develop and lead joint research between energy and automotive companies. Specifically, Paul currently serves as co-chair of the Emissions Committee within the Coordinating Research Council (CRC) investigating fuel effects and engine hardware impacts on vehicle emissions.

Matthew Sheehan

Chevron

Matt Sheehan has 28 years industry experience, 19 of those with Chevron. His responsibilities include fuels product strategy, expertise on fuel specifications and performance, and coordination of our industry committee activities. Matt is President of the Coordinating Research Council Board of Directors and is Section Chair for ASTM D02.A0.01 for Gasoline and Gasoline-Oxygenate Blends.

Previously, Matt served as Biofuels Technology Commercialization Manager where he developed the integration of renewable fuels processing in our refineries. He also has extensive experience in product line management and regulatory policy.

Session Chairs

Michael Aldridge

US Enviromental Protection Agency

Dr. Michael Aldridge is a scientist in the Assessment and Standards Division of EPA's Office of Transportation and Air Quality. His work focuses on emissions inventory modeling of mobile sources which includes development of EPA's MOVES model, Nonroad model, and Marine Emissions Tools. Michael holds a B.A. in Physics from New College of Florida and PhD in Materials Science and Engineering from the University of Michigan.

Sam Cao

South Coast Air Quality Management District

Dr. Sam Cao is a Program Supervisor at the Technology Demonstration group at South Coast AQMD. He has a Ph.D. in Chemical and Environmental Engineering University of California, Riverside, specializing in in-use emissions measurement from off-road construction equipment and a MBA from Indiana University. Sam currently manages various low-emissions and zero emission technology demonstration and research projects. Prior to joining South Coast AQMD, he worked at Cummins Inc. in Advanced Emissions Development group for 5 years.

Yusuf Khan

Cummins Inc.

Dr. Yusuf Khan is the CTC Emissions Lab Leader within Global Technical Operations - Engine Business at Cummins Inc. Since joining Cummins in 2013 after earning his Ph.D. in Chemical & Environmental Engineering from the University of California, Riverside, he has been a global expert in emissions measurement and test procedures. Dr. Khan currently leads the Cummins Technical Center Emissions Lab for engine development and certification testing. His industry involvement includes serving as co-chair of the Truck & Engine Manufacturer Association's Emissions Measurement & Testing Committee and representing Cummins in the European Automobile Manufacturers' Association (ACEA), the SAE Emission Standard Committee, and the US for ISO Technical Committee.

Session Chairs

Andrew Kotz

National Renewable Energy Lab

Dr. Andrew Kotz is a Senior Research Engineer at the U.S. Department of Energy National Renewable Energy Lab where he is part of the Center for Integrated Mobility Science's Commercial Vehicle Technology team. Andrew received his Ph.D. in Mechanical Engineering from the University of Minnesota where he researched real-world transit bus NOx emissions and vehicle big data. At NREL, Andrew's work focuses on heavy duty electrification, vehicle emissions and big data that help advance energy efficient and renewable transportation.

Joseph Martin

US Enviromental Protection Agency

Dr. Joseph Martin is a researcher with the USEPA's Office of Research and Development, in the Surface and Fine Scale Branch of the Center for Environmental Modeling and Measurement. He recieved an MPH in Environmental Quality and Health from the University of Michigan's School of Public Health and a Ph.D. in Soil Chemistry from Purdue University. At EPA, Joseph's work is centered on characterization of IVOC/SVOC emissions from multiple sources, supporting method development, emissions invetories, and regulatory action.

Rada Purushothamon

Caterpillar, Inc.

Dr. Rada Purushothaman is a Senior Engineering Specialist, Global Engine Development at Caterpillar. Rada joined Caterpillar as an intern in Advanced Materials Technology in 2006. He worked as an engineer for Heat Treatment and Furnace Atmosphere Monitoring Systems. Rada later joined the Engine Emissions Measurement team in 2009 to support the Non-Road Tier IV engine development. His team is responsible for gaseous, particulate and particle emissions measurement for testing and compliance to various global emissions regulations. Rada is currently Chairman of the Truck and Engine Manufacturers Associations' (EMA's) Emissions Measurement and Testing Committee (EMTC) and has been a member of that committee for over 10 years. The EMTC meets regularly with US EPA and CARB to draft and amend emissions test procedures. The EMTC also sponsors and funds projects to improve emissions measurement and testing issues. Rada is also a member in SAE Emissions Standards Committee. Rada's research interests include Particulate and Particle Measurement and Emissions Measurement Uncertainty. He holds a M.S. and Ph.D. from Worcester Polytechnic Institute, Massachusetts in Manufacturing Engineering.

Session Chairs

Heidi Vreeland

US Enviromental Protection Agency

Dr. Heidi Vreeland is a researcher at the U.S. Environmental Protection Agency in the Office of Research and Development. Her work at EPA includes investigating air quality impacts from combustion source emissions, and managing light-duty and heavy-duty dynamometer research. Heidi holds a M.S. from the Georgia Institute of Technology and Ph.D. from Duke University in Environmental Engineering.

Laxmi Reddy Yatavelli

California Air Resources Board

Dr. Reddy Yatavelli is a manager in the Mobile Source Laboratory Division of CARB. His work focuses on advanced technology and emissions evaluation of small handle-held to large on- and off-road engines. Prior to joinig CARB, Reddy was a research faculty at Desert Research Institute, Reno, NV, and before than a post-doctoral researcher in Cooperative Institute for Research in the Environmental Sciences (CIRES), University of Colorado, Boulder. Reddy holds a B.S. in Mechanical Engineering from Bangalore University, India, a M.S. in Mechanical Engieering from Ohio Univeristy, Athens, OH, and a M.S. and Ph.D. in Atmospheric Sciences from the University of Washington, Seattle, WA.

Seungju Yoon

California Air Resources Board

Dr. Seungju Yoon is a manager with California Air Resources Board, Research Division. He oversees on-road and off-road mobile source research programs of mitigating greenhouse gas emissions from mobile air conditioners (MVAC), characterizing in-use vehicle emissions and activity and their impact on air quality, investigating emissions reduction opportunities using laboratory, remote-sensing, and engine and activity data-logging technologies, and understanding non-tailpipe emissions such as brake and tire wear. Seungju holds a master's degree in environmental engineering – air pollution control and a Ph. D degree in civil engineering – transportation systems from the Georgia Institute of Technology. He has over 20 years of experience in transportation and air quality research and policy development.

	Sunday, April 13, 2025		
4:30-6:00 PM	Registration and Poster Setup in Farrell's Lounge		
6:00-7:00 PM	Welcome Reception in Dawson and Landmark Patio (3rd Floor Terrace)		
	Monday, April 14, 2025		
	All sessions take place in Bixby Ballroom, unless otherwise noted		
7:00 AM	**Registration in Bixby Foyer and Continental Breakfast in Farrell's Lounge**		
8:00 AM	**Welcome from the Chairs: Matt Sheehan, Chevron & Michael Moore, Stellantis**		
8:15 AM	***Keynote Address: "The Road to Clean Cars" Kent Hoekman, Desert Research Institute***		
SESSION 1			
9:00 AM	**Air Quality and Regional Emissions Impacts**		
	Introduction by Session Leaders, Heidi Vreeland and Joe Martin, US EPA, Sam Cao, SCAQMD; Yusuf Khan, Cummins		
9:05 AM	ADDRESSING DIESEL POLLUTION IN ENVIRONMENTAL JUSTICE COMMUNITIES: A WEST OAKLAND CASE STUDY	Stephen Reid	Bay Area Air Quality Management District
9:20 AM	COMMUNITY-LEVEL EQUITY ANALYSIS OF TRUCK EMISSIONS BASED ON HIGH-RESOLUTION EMISSION INVENTORY	Sahar Fazelvalipour*	University of Southern California
9:35 AM	THE IMPACT OF PHASE 2 GHG REGULATIONS ON CALIFORNIA HEAVY-DUTY VEHICLE INVENTORY AND EMISSIONS	Hamid Niakani	California Air Resources Board
9:50 AM	ATTRIBUTING SOURCE CONTRIBUTIONS TO ENVIRONMENTAL CHANGES	Karl Ropkins	University of Leeds
10:05 AM	FINE-SCALE DAILY PM2.5 SOURCE IMPACTS FROM 2011 TO 2020 ACROSS THE UNITED STATES	Ting Zhang	George Mason University
10:20 AM	General Discussion and Open Q & A		
10:35 AM	**Poster Session and Demonstrations in Farrell's Lounge**		
SESSION 2			
11:10 AM	**Decarbonization: Technologies, Complications, and Mitigation Strategies / Electric and Hybrid Vehicles**		
	Introduction by Session Leader: Andrew Kotz, NREL		
11:15 AM	VEHICLE ACTIVITY PROFILES: A STUDY OF DIFFERENCES BETWEEN HEAVY-DUTY BATTERY ELECTRIC AND CONVENTIONAL DRAYAGE TRUCKS	Georges Saliba	California Air Resources Board
11:30 AM	IMPACT OF DRIVER BEHAVIOR ON EMISSIONS: INSIGHTS FROM A LARGE-SCALE CONNECTED VEHICLE DATASET	Will Northrop	University of Minnesota - Twin Cities
11:45 AM	ASSESSING THE IMPACTS OF ELECTRIFICATION ON MEDIUM- AND HEAVY-DUTY VEHICLE CRITERA POLLUTANT EMISSIONS	Polina Alexeenko	National Renewable Energy Laboratory
12:00 PM	H2-ICE AFTERTREATMENT FOR ON-ROAD HEAVY-DUTY APPLICATIONS	Bryan Zavala	Southwest Research Institute
12:15 PM	ASSESSING THE LONG-TERM POTENTIAL IMPACT OF BIODIESEL CONTAMINANTS ON LOW NOX EMISSIONS CONTROL SYSTEM PERFORMANCE	Christopher Sharp	Southwest Research Institute
12:30 PM	General Discussion and Open Q & A		
12:45 PM	**Lunch Break in Pike Ballroom**		

Monday, April 14, 2025

SESSION 3			
2:15 PM	**Emissions Measurement Methods**		
	Introduction by Session Leader: Yusuf Khan, Cummins, Inc.		
2:20 PM	CHALLENGES AND SUCCESSES OF MEASURING NEAR-ZERO PM LEVELS OVER CHASSIS DYNAMOMETER CERTIFICATION CYCLES	Benjamin Shade	AVL
2:35 PM	LIGHT DUTY PEMS PHASE 3: PEMS PERFORMANCE AT ALTITUDE, GRADE AND LOW TEMPERATURE TEST PROGRAM (CRC PROJECT NO. E-134)	Matt Panec	44 Energy
2:50 PM	APPLICATION OF A DIFFUSION CHARGER TO QUANTIFY TRANSIENT PARTICLE EMISSIONS FROM VERY LOW TO HIGH EMITTING LIGHT-DUTY VEHICLES	Heejung Jung	University of California, Riverside
3:05 PM	INFLUENCE OF NOx CONCENTRATIONS AND SAMPLING SYSTEM ON ANALYZER NOISE	Jimmy Williamson	AVL Test System Inc
3:20 PM	General Discussion and Open Q & A		
3:35 PM	**Poster Session and Demonstrations in Farrell's Lounge**		

SESSION 3			
4:05 PM	**Emissions Measurement Methods (Continued)**		
	Welcome Back by Session Leader: Yusuf Khan, Cummins Inc.		
4:05 PM	DEVELOPMENT OF HEAVY-DUTY ELECTRIC VEHICLE ENERGY RATES FOR EPA MOVES MODEL	Setayesh Fakhimi	National Renewable Energy Laboratory (NREL)
4:20 PM	VEHICLE DIGITAL TWINNING WITHOUT A DYNAMOMETER OR LABORATORY	Phil Roberts	HORIBA MIRA (UK)
4:35 PM	General Discussion and Open Q & A		
4:50 PM	Logistics for Dinner Event	Jan Tucker	Coordinating Research Council, Inc.
4:55 PM	**END OF DAY**		
5:45 PM	Meet in Lobby to Leave for Networking Dinner, Last Bus Leaving at 6:00 PM		

	Tuesday, April 15, 2025		
7:00 AM	**Registration in Bixby Foyer and Continental Breakfast in Farrell's Lounge**		
8:00 AM	**Keynote Introduction by Workshop Co-Chair, Michael Moore, Stellantis**		
8:05 AM	***Keynote Address: "CRC: Past, Present, and Future"*** ***Wayne Miller, University of California, Riverside***		
SESSION 4			
8:55 AM	**In Use Exhaust Emissions: On Road, Off Road, and Non-Road**		
	Introduction by Session Leader: Rada Purushothaman, Caterpillar		
9:00 AM	A COMPARISON OF IN-USE TEST RESULTS USING NTE AND MAW FOR ENGINES SUBJECTED TO US EPA TEST ORDERS	Morgan Bogdanski	US Environmental Protection Agency
9:15 AM	MOBILE HYDRAULIC ENGINE DYNAMOMETER	Axel Freund	California Air Resources Board
9:30 AM	EXHAUST EMISSIONS FROM OFF-ROAD EQUIPMENT ON MOBILE HYDRAULIC DYNAMOMETER (MOHYD)	Daniel Zaragoza	California Air Resources Board
9:45 AM	General Discussion and Open Q & A		
10:00 AM	**Poster Session and Demonstrations in Farrell's Lounge**		
SESSION 4			
10:40 AM	**In Use Exhaust Emissions: On Road, Off Road, and Non-Road**		
	Welcome Back by Session Leader: Rada Purushothaman, Caterpillar		
10:45 AM	REAL-WORLD TAILPIPE AMMONIA EMISSIONS FROM LIGHT-DUTY GASOLINE VEHICLES	Elizabeth DeFrance*	University of California, Riverside
11:00 AM	EFFORTS TO IDENTIFY AND QUANTIFY THE PREVALANCE AND EMISSIONS IMPACT OF MEDIUM- AND HEAVY-DUTY DIESEL VEHICLE TAMPERING	Carl Fulper	US Environmental Protection Agency
11:15 AM	General Discussion and Open Q & A		
11:30 AM	**Lunch in Pike Ballroom**		

Tuesday, April 15, 2025

SESSION 5

1:00 PM	**Alternate Fuel and Zero-Emissions Vehicles (Hydrogen, Non-Carbon Fuels, Battery-**		
	Introduction by Session Leader: Andrew Kotz, NREL		
1:05 PM	FUEL/ENGINE COMBUSTION TECHNOLOGIES WITH HIGH SOLID SUB-23 NM PARTICLE NUMBER & ULTRA LOW SOOT MASS	Imad Khalek	Southwest Research Institute
1:20 PM	INFLUENCE OF HYDROGEN BLENDING ON ENGINE PERFORMANCE AND EMISSIONS FROM AN ULTRA-LOW NOX NATURAL GAS HEAVY-DUTY ENGINE	Zisimos Toumasatos*	University of California, Riverside
1:35 PM	EMISSIONS FROM MULTI-GAS ENGINES USED IN GENERATORS FOR THE UK CONSTRUCTION SECTOR	Carl Desouza	Imperial College London
1:50 PM	COMPARISON OF BRAKING ACTIVITY FROM ZERO-EMISSION AND CONVENTIONAL HEAVY-DUTY VEHICLES	Michelia Dam	California Air Resources Board
2:05 PM	CRC SUSTAINABLE MOBILITY COMMITTEE ACTIVITIES	Elana Chapman	General Motors
2:20 PM	General Discussion and Open Q & A		
2:35 PM	**Poster Session and Demonstrations in Farrell's Lounge**		

SESSION 6

3:05 PM	**Emissions Control Measures: I/M, OBD, Technologies and Strategies**		
	Introduction by Session Leader: Laxmi Reddy Yatavelli, CARB		
3:10 PM	HEAVY-DUTY VEHICLE INSPECTION AND MAINTENANCE PROGRAM IN CALIFORNIA – THE CLEAN TRUCK CHECK, CARBTEST REFEREE PROGRAM	Tom Durbin	University of California, Riverside
3:25 PM	NEW EMISSIONS VERIFICATION DURING PERIODIC TECHNICAL INSPECTION (PTI)	Ricardo Suarez-Bertoa	European Commission, Joint Research Centre
3:40 PM	AN EXTREME VALUE THEORY VIEW OF HIGH EMITTER TRENDS FROM ROADSIDE REMOTE SENSING DATA	Matti Maricq	Forest Glen Consulting
3:55 PM	ON-BOARD EMISSION MEASUREMENT WITH NOX SENSORS	Yang Li	Cummins Corp R&T
4:10 PM	General Discussion and Open Q & A		
4:25 PM	**END OF DAY**		
5:30 PM	**Poster Session, Demonstrations, and Evening Reception in Farrell's Lounge**		

	Wednesday, April 16, 2025		
7:00 AM	**Registration in Bixby Foyer and Continental Breakfast in Farrell's Lounge**		
8:00 AM	**Welcome Back by Workshop Co-Chair, Matthew Sheehan, Chevron**		
SESSION 7			
8:10 AM	**Emissions Modeling**		
	Introduction by Session Leader: Michael Aldridge, US EPA, and Lucas Algrim, California Air Resources Board		
8:15 AM	AN OVERVIEW OF EMFAC202Y UPDATES	Cindy Yañez	California Air Resources Board
8:30 AM	MOVES5 UPDATES AND RESULT COMPARISONS	Megan Beardsley	US Environmental Protection Agency
8:45 AM	SENSITIVITY OF MOVES4.0 ENERGY USE AND EMISSION RATES ACROSS MULTIPLE INPUT VARIABLE DIMENSIONS	Hongyu Lu*	Georgia Institute of Technology
9:00 AM	UPDATING LD VMT SPEED-DISTRIBUTIONS AND SPEED CORRECTION FACTORS IN EMFAC2020Y TO BETTER CAPTURE EMISSIONS OF HIGH-SPEED DRIVING	Lucas Algrim	California Air Resources Board
9:15 AM	General Discussion and Open Q & A		
9:35 AM	**Poster Session and Demonstrations in Farrell's Lounge**		
SESSION 7			
10:20 AM	**Emissions Modeling**		
	Introduction by Session Leader: Michael Aldridge, US EPA, and Lucas Algrim, California Air Resources Board		
10:25 AM	ENHANCING AIR QUALITY IMPACT ASSESSMENT OF FREIGHT-RELATED EMISSION WITH LARGE-SCALE, REAL-WORLD TRUCK ACTIVITY DATA	Yejia Liao*	University of California, Riverside
10:40 AM	DEVELOPMENT OF TEXAS-SPECIFIC DRIVE CYCLES FOR ELECTRICAL AND CONVENTIONAL VEHICLES USING WEJO DATA	Rodolfo Souza	Texas A&M Transportation Institute
10:55 AM	DEVELOPMENT OF A RESEARCH TOOL TO ESTIMATE EMISSIONS INVENTORY IMPACTS OF TAMPERED HEAVY-DUTY DIESEL VEHICLES	Jaehoon Han	US Environmental Protection Agency
11:10 AM	General Discussion and Open Q & A		
11:30 AM	**Lunch in Pike Ballroom**		

Wednesday, April 16, 2025

SESSION 8

12:50 PM	**Non-Exhaust Emissions**		
	Introduction by Session Leader: Seungju Yoon, California Air Resources Board		
12:55 PM	MOBILE SOURCE NON-EXHAUST EMISSIONS: RESEARCH NEEDS FOR REGIONAL AIR QUALITY, COMMUNITY EXPOSURE/HEALTH EFFECTS, AND GREENHOUSE GAS EMISSIONS IN CALIFORNIA	Seungju Yoon	California Air Resources Board
1:10 PM	LIGHT-DUTY VEHICLE TIRE-WEAR PARTICLE EMISSIONS	Elizabeth DeFrance*	University of California, Riverside
1:25 PM	CHARACTERIZING NON-EXHAUST EMISSIONS FROM CONVENTIONAL AND ELECTRIC VEHICLES OVER CHASSIS DYNAMOMETER TEST CYCLES	Okjoo Park	California Air Resources Board
1:40 PM	IDENTIFICATION OF ORGANIC VOLATILES AS SPECIFIC MARKERS FROM BRAKE AND TIRE WEAR	Veronique Perraud	University of California, Irvine
1:55 PM	TIRE AND ROAD WEAR NANOPARTICLE EMISSIONS: WHERE DO THEY COME FROM AND HOW MANY ARE THERE?	Adam Boies	Stanford University
2:10 PM	SPATIOTEMPORAL CHARACTERIZATION OF NON-TAILPIPE EMISSIONS FROM MOBILE AND STATIONARY MEASUREMENTS	Cheol-Heon Jeong	University of Toronto
2:25 PM	TIRE EMISSIONS FACTORS, ENVIRONMENTAL RISKS AND MITIGATIONS	Nick Molden	Emissions Analytics
2:40 PM	General Discussion and Open Q & A		
2:55 PM	**Closing Remarks from Workshop Chairs** **Matt Sheehan, Chevron** **Michael Moore, Stellantis**		
3:05 PM	**END OF WORKSHOP**		

POSTERS

Air Quality and Regional Emissions Impacts		
URBAN MEASUREMENTS OF ULTRAFINE PARTICLES IN AMBIENT AIR WITH THE AVL ULTRAFINE PARTICLE MONITOR	Manfred Linke	AVL Graz
HEAVY-DUTY VOCATIONAL VEHICLE NOX EMISSION IMPACTS ON DISADVANTAGED COMMUNITIES	Troy Hurren*	University of California, Riverside
Decarbonization: Technologies, Complications, and Mitigation Strategies / Electric and Hybrid Vehicles		
ACTIVITY DATA OF ZERO AND NEAR-ZERO PORT-RELATED EQUIPMENT AND VEHICLES	Tom Durbin	University of California, Riverside
Emissions Measurement Methods		
HEAVY-DUTY DIESEL EMISSIONS MONITORING USING LOW-COST SENSORS	Spencer Larson*	Brigham Young University
DEVELOPMENT OF AN EXPERIMENTAL SETUP FOR PEMS RDE USING PORTABLE FTIR	Vahid Hosseini	Simon Fraser University
INVESTIGATION OF EXHAUST LEAK EMISSIONS WITH A SPECIAL FOCUS ON HEAVY-DUTY NATURAL GAS VEHICLES	Zisimos Toumasatos	University of California, Riverside
In Use Exhaust Emissions: On Road, Off Road, and Non-Road		
EFFECTS OF AMBIENT TEMPERATURE AND AGE ON NOX EMISSIONS FROM HEAVY-DUTY VEHICLES MEAURED IN UTAH AND CALIFORNIA	Amber Allen*	Brigham Young University
RESULTS OF SENSOR BASED ONBOARD SENSING ANALYSIS AND REPORTING FROM VARIOUS FLEETS DURING A TWO MONTH TIMEFRAME	Grace Johnson*	University of California, Riverside
EMISSIONS FROM OFF-HIGHWAY CONSTRUCTION EQUIPMENT IN EUROPE	Nick Molden	Emissions Analytics
REAL WORLD LASER SPECTROSCOPY-BASED IN-SITU EMISSIONS TESTING ON DIESEL TRUCKS	Ritobrata Sur	Indrio Technologies Inc.
REAL-WORLD MEASUREMENTS OF MAIN ENGINE FUEL USE AND EMISSIONS FROM TWO PASSENGER FERRY VESSELS	Sebastian Larrahondo*	North Carolina State University
APPLICATION OF PHYSICS-INFORMED NEURAL NETWORKS FOR SIMULATION OF SELECTIVE CATALYTIC REDUCTION CATALYST	Venkata Rajesh Chundru	Southwest Research Institute
SCOPING STUDY ASSESSMENT OF TECHNOLOGY AND FUEL PROPERTY EFFECTS ON PARTICLE EMISSION FROM MODERN LIGHT-DUTY GASOLINE VEHICLES	Steve McConnell	Marathon Petroleum, Inc.
Alternate Fuel and Zero-Emissions Vehicles (Hydrogen, Non-Carbon Fuels, Battery-Electric fuel cells)		
COMPARATIVE ANALYSIS OF LIFECYCLE GREENHOUSE GAS EMISSIONS OF PROPANE POWERED FORKLIFTS WITH ELECTRIC FORKLIFTS FROM A MARGINAL AND AVERAGE GRID EMISSIONS PERSPECTIVE	Sai Satish Guda	Propane Education & Research Council

POSTERS		
Emissions Control Measures: I/M, OBD, Technologies and Strategies		
INVESTIGATING VEHICLE EMISSIONS IN NIGERIA USING AN UPDATED I/M PROCEDURE	Daisy Thomas	3DATX Corporation
TELEMATICS DATA AND VEHICLE SPEED: CHANGES BETWEEN 2020 AND 2022	John Koupal	ERG
Emissions Modeling		
ANALYSIS OF NEW NATIONAL GASOLINE SURVEY DATA AND ITS APPLICATION IN MOVES5	Aron Butler	US Environmental Protection Agency
COMPARISON OF REAL-WORLD EMISSIONS FROM HEAVY-DUTY DIESEL VEHICLES TO MOVES4	Emma Reeves*	Brigham Young University
DEVELOPMENT OF 2023 TEXAS STATEWIDE AERR AIRPORT EMISSIONS INVENTORY AND 2011 THROUGH 2050 TREND INVENTORIES	Venugopal, Madhusudhan	Texas A&M Transportation institute
Non-Exhaust Emissions		
LABORATORY STUDY OF THE CONTRIBUTION OF PHENOLIC RESIN THERMAL DEGRADATION TO AUTOMOTIVE BRAKE EMISSIONS	Berenice Rojas*	University of California, Irvine
EVALUATION OF THE NON-EXHAUST PARTICLE EMISSIONS COLLECTED FROM A VEHICLE DRIVING ON THE REAL ROAD	Hwansoo Chong	National Institute of Environmental Research
CHEMICAL COMPOSITION ANANLYSIS OF TIRE-ROAD-WEAR PARTICLES FROM A VEHICLE IN REAL ROAD DRIVING CONDITION	Yunsung Lim	National Institute of Environmental Research
COMPREHENSIVE ASSESSMENT OF PM EMISSIONS IN ELECTRIFICATION STRATEGIES FOR VEHICLES	Seokhwan Lee	Korea Institute of Machinery and Materials
MEASUREMENT OF NON-EXHAUST PARTICULATE MATTER EMISSIONS FROM MOBILE SOURCES USING RUNNING LOSS - SEALED HOUSING FOR EVAPORATIVE DETERMINATION	Yilin Ma	California Air Resources Board
UCR BRAKE-WEAR AND TIRE-WEAR SAMPLING SYSTEM DEVELOPMENT – TECHNOLOGY DEMONSTRATION AND UPDATES	Zisimos Toumasatos*	University of California, Riverside

DEMONSTRATIONS		
FAST RESPONSE GAS ANALYSERS	Jerry Hall	Cambustion
TBD	Richard Frazee	IAG-ng Inc.
REAL TIME BRAKE/TIRE/COMBUSTION PARTICULATE MEASUREMENTS AND OXIDATION FLOW REACTOR	Erkki Lamminen	Dekati Ltd
DRIVING THE FUTURE OF EMISSIONS WITH REAL TIME DATA & CUSTOMIZATION	Earl Leatherland	Global MRV, Inc.
TBD	Jimmy Williamson	AVL

Coordinating Research Council, Inc.
1 Concourse Parkway Suite 800
Atlanta GA 30328
678-795-0506