

NOAA ESRL GLOBAL MONITORING ANNUAL CONFERENCE 2014

David Skaggs Research Center, Room GC-402
325 Broadway, Boulder, Colorado 80305 USA

Tuesday Morning, May 20, 2014 AGENDA

(Only presenter's name is given; please refer to abstract for complete author listing.)

- **07:00** **Registration Opens in GC-402 - lunch orders and posters collected at registration table**
 - **07:30 - 08:30** **Morning Snacks - Coffee, tea, fruit, bagels and donuts served**
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|---|----------|
| • Session 1 Welcome, Keynote Address & Highlights — Chaired by James Butler | |
| 08:30 - 08:45 Welcome and Conference Overview | - |
| <i>James H. Butler (NOAA Earth System Research Laboratory, Boulder, CO)</i> | |
| 08:45 - 09:15 Atmospheric Signatures of Changing Global Biogeochemistry | 1 |
| <i>Ralph Keeling (Scripps Institution of Oceanography, La Jolla, CA)</i> | |
| 09:15 - 09:30 The Earth Is Round: Some Elements of a Sustainable Society | 2 |
| <i>Pieter Tans (NOAA Earth System Research Laboratory, Boulder, CO)</i> | |
| 09:30 - 09:45 Continued Permafrost Warming on the Arctic Slope of Alaska, 2014 Update | 3 |
| <i>Gary Clow (United States Geological Survey (USGS), Boulder, CO)</i> | |
| 09:45 - 10:00 International Arctic Systems for Observing the Atmosphere (IASOA) – A Portal for Discovery, a Platform for Pan-Arctic Collaboration | 4 |
| <i>Sandra Starkweather (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)</i> | |
| • 10:00 - 10:30 Morning Break | |
| • Session 2 Carbon Cycle & Greenhouse Gases - Measurements — Chaired by Arlyn Andrews | |
| 10:30 - 10:45 Detection and Quantification of Urban Greenhouse Gas Emissions: Ground-based Results of the Indianapolis FLUX (INFLUX) Experiment | 5 |
| <i>Natasha Miles (The Pennsylvania State University, University Park, PA)</i> | |
| 10:45 - 11:00 Partitioning of Urban Fossil Fuel CO ₂ Emissions by Source Sector: Results from the Indianapolis FLUX (INFLUX) Experiment | 6 |
| <i>Jocelyn Turnbull (GNS Science, New Zealand, and Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)</i> | |
| 11:00 - 11:15 Amazon Basin-wide Fluxes of CO ₂ and CH ₄ from Aircraft Vertical Profiles | 7 |
| <i>John B. Miller (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)</i> | |
| 11:15 - 11:30 Seasonality and Trends of Atmospheric Transport Events to Summit, Greenland Derived from Long-term Non-methane Hydrocarbon Observations | 8 |
| <i>Chelsea Thompson (Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO)</i> | |
| 11:30 - 11:45 Historic European Non-CO ₂ Atmospheric Greenhouse Gas Records: Harmonization and Uncertainty Assessment | 9 |
| <i>Samuel Hammer (University of Heidelberg, Institut für Umweltphysik, Heidelberg, Germany)</i> | |
| 11:45 - 12:00 A Half-century Record of State-by-State Changes in Fossil Fuel Carbon Emissions and Corresponding Isotope Ratios in the United States | 10 |
| <i>T.J. Blasing (Independent Scholar, Knoxville, TN)</i> | |
| • 12:00 - 13:00 Catered Lunch - Outreach Classroom GB-124 (pre-payment of \$12.00 at registration) | |

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- **Session 3** **Carbon Cycle & Greenhouse Gases - Satellites & Modeling** — Chaired by Ed Dlugokencky
 - 13:00 - 13:15 The Ability of Satellite-based CO₂ Measurements to Constrain Carbon Cycle Science: From Greenhouse Gases (GHG) Observing SATellite (GOSAT) to Orbiting Carbon Observatory (OCO-2) 11
Christopher O'Dell (Colorado State University, Department of Atmospheric Science, Fort Collins, CO)
 - 13:15 - 13:30 Launch and Early Operations of the National Aeronautics & Space Administration (NASA) Orbiting Carbon Observatory-2 12
David Crisp (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA)
 - 13:30 - 13:45 Validation of Total Carbon Column Observing Network (TCCON) Observations of CO₂/CH₄/CO at Sodankylä Using AirCore 13
Huilin Chen (Centre for Isotope Research, University of Groningen, Groningen, Netherlands)
 - 13:45 - 14:00 Constraining Fossil Fuel CO₂ Emissions with Joint Assimilation of Atmospheric CO₂ and ¹⁴CO₂ Measurements 14
Sourish Basu (NRC Post-Doc & NOAA Earth System Research Laboratory, Boulder, CO)
 - 14:00 - 14:15 CarbonTracker-Lagrange: A New Tool for Regional- to Continental-scale Flux Estimation 15
Arlyn E. Andrews (NOAA Earth System Research Laboratory, Boulder, CO)
 - 14:15 - 14:30 Estimation of the Permafrost Carbon Feedback Using The SiBCASA Terrestrial Carbon Cycle Model 16
Elchin Jafarov (National Snow and Ice Data Center (NSIDC), Boulder, CO)
 - 14:30 - 14:45 Evaluating Models of Wetland CH₄ Emissions: How Believable Are Simulations of Future Emissions? 17
Lori Bruhwiler (NOAA Earth System Research Laboratory, Boulder, CO)
- **14:45 - 15:15 Afternoon Break**
- **Session 4** **Aerosols** — Chaired by Elisabeth Andrews
 - 15:15 - 15:30 Comparison of Aerosol Absorption Optical Depth from Remote-sensing and *In Situ* Measurements 18
John A. Ogren (NOAA Earth System Research Laboratory, Boulder, CO)
 - 15:30 - 15:45 Constraining Global Models of Black Carbon (BC) Aerosol with Pole-to-Pole Observations 19
Joshua Schwarz (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
 - 15:45 - 16:00 Can We Characterize Aerosol Type Using Aerosol Optical Properties? 20
Lauren Schmeisser (Universiteit van Amsterdam & NOAA Earth System Research Laboratory, Boulder, CO)
 - 16:00 - 16:15 A Small, Sensitive, Light-weight, and Disposable Aerosol Spectrometer for Balloon and Unmanned Aerial Vehicle Applications 21
Hagen Telg (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
 - 16:15 - 16:30 Biomass Burning at Cape Grim: Using Modeling to Explore a Possible Urban Influence on Plume Photochemistry and Composition 22
Sarah J. Lawson (Commonwealth Scientific Industrial Research Organization (CSIRO), Marine and Atmospheric Research, Aspendale, Australia)
 - 16:30 - 16:45 Aerosols at Mauna Loa Observatory (MLO) – Spring 2001, Versus Spring and Fall, 2011 23
Thomas A. Cahill (University of California at Davis, Davis, CA)
- **17:00 - 20:00 Poster Session (DSRC Cafeteria) with appetizers and refreshments**

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- **07:00 - 08:30** **Registration & Morning Snacks - Coffee, tea, fruit, bagels and donuts served** Page No.

- **Session 5** **Ozone & Water Vapor** — Chaired by Samuel Oltmans
- 08:30 - 08:45 The Alpha Jet Atmospheric EXperiment (AJAX): Three Years of Airborne Ozone and Greenhouse Gas Measurements Over California and Nevada 24
Emma L. Yates (National Aeronautics & Space Administration (NASA) Ames Research Center, Atmospheric Science Branch, Moffett Field, CA)
- 08:45 - 09:00 An Overview of the 2013 Las Vegas Ozone Study (LVOS) 25
Andrew Langford (NOAA Earth System Research Laboratory, Boulder, CO)
- 09:00 - 09:15 Source Distribution of Elevated Ozone in the Northern Colorado Front Range 26
Detlev Helmig (Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO)
- 09:15 - 09:30 Past Changes in the Vertical Distribution of Ozone: The SPN Activity and Its Outcome 27
Karen H. Rosenlof (NOAA Earth System Research Laboratory, Boulder, CO)
- 09:30 - 09:45 The Pandora Spectrometer System: O₃ and Multiple Other Species Measured Using a Small, Inexpensive Package 28
Irina Petropavlovskikh (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- 09:45 - 10:00 Observed Global and Regional Variation in Earth's Water Vapor: Focus on the Weather-climate Interface 29
John Forsythe (Colorado State University, Cooperative Institute for Research in the Atmosphere, Fort Collins, CO)
- 10:00 - 10:15 Validation of Aura Microwave Limb Sounder Stratospheric Water Vapor Measurements by the NOAA Frost Point Hygrometer 30
Dale Hurst (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)

- **10:15 - 10:45** **Morning Break**

- **Session 6** **Radiation** — Chaired by Kathleen Lantz
- 10:45 - 11:00 The National Ecological Observatory Network (NEON): Overview and Strategies for Radiation Measurements Across the Continent 31
Jeffrey Taylor (National Ecological Observatory Network (NEON), Boulder, CO)
- 11:00 - 11:15 Evidence for the Long-term Stability of the Eppley Model PIR for Measurements of Broadband Infrared Measurements 32
Joseph Michalsky (NOAA Earth System Research Laboratory, Boulder, CO)
- 11:15 - 11:30 Results of Second Outdoor Comparison Between Absolute Cavity Pyrgeometer (ACP) and Infrared Integrating Sphere (IRIS) Radiometer at Physikalisch-Meteorologisches Observatorium Davos (PMOD) 33
Ibrahim Reda (National Renewable Energy Laboratory (NREL), Golden, CO)
- 11:30 - 11:45 Radiative Forcing of a Small-scale Wildfire Smoke Plume at the Surface, Atmosphere, and Top of Atmosphere (TOA) from Surface and Satellite Observations 34
John A. Augustine (NOAA Earth System Research Laboratory, Boulder, CO)

- **11:45 - 13:00** **Catered Lunch - Outreach Classroom GB-124 (pre-payment of \$12.00 at registration)**

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• Session 7	Halocarbons & Non-Methane Hydrocarbons — Chaired by James Elkins	
13:00 - 13:15	Recent Trends in Global Concentrations and Emissions of Hydrochlorofluorocarbons (HCFCs) and Hydrofluorocarbons (HFCs) <i>Steve Montzka (NOAA Earth System Research Laboratory, Boulder, CO)</i>	35
13:15 - 13:30	Atmosphere-based “Top-down” Emission Estimates of 1,1,1,2-Tetrafluoroethane (HFC-134a) and Chlorodifluoromethane (HCFC-22) for the United States (U.S.) Over Multiple Years <i>Lei Hu (NRC Post-Doc & NOAA Earth System Research Laboratory, Boulder, CO)</i>	36
13:30 - 13:45	European Emissions of Chlorodifluoromethane (HCFC-22) Based on High Frequency Atmospheric Measurements and a Bayesian Inversion Method <i>Michela Maione (University of Urbino, Department of Basic Sciences and Foundations, Urbino, Italy)</i>	37
13:45 - 14:00	Measurements of Bromine Oxide, Iodine Oxide and Oxygenated Hydrocarbons in the Tropical Free Troposphere from Research Aircraft and Mountaintops <i>Rainer Volkamer (Cooperative Institute for Research in Environmental Sciences (CIRES), Department of Chemistry and Biochemistry, University of Colorado, Boulder, CO)</i>	38
14:00 - 14:15	A Seven-year (2006-2013) Record of NonMethane HydroCarbons (NMHC) in the Subtropical Marine Boundary Layer at the Cape Verde Atmospheric Observatory <i>Shalini Punjabi (The University of York, Department of Chemistry, Heslington, York, United Kingdom)</i>	39
14:15 - 14:30	Real-time Quantification and Geo-spatial Mapping of Volatile Organic Compounds (VOC) and SemiVolatile Organic Compounds (SVOC) by Tandem Mass Spectrometry <i>Ryan Bell (Applied Environmental Research Laboratories, Nanaimo, British Columbia, Canada)</i>	40
• 14:30 - 15:00	Afternoon Break	
• Session 8	Oil & Gas Fields — Chaired by Gabrielle Petron	
15:00 - 15:15	Development of a Calibration for Estimating Flared Gas Volume for Gas Flaring from Nighttime Visible Infrared Imaging Radiometer Suite (VIIRS) Data <i>Chris Elvidge (NOAA National Geophysical Data Center, Earth Observation Group, Boulder, CO)</i>	41
15:15 - 15:30	Methane Emissions Estimates from Oil and Natural Gas Production Using Atmospheric Measurements <i>Anna Karion (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)</i>	42
15:30 - 15:45	Quantifying Relative Contribution of Natural Gas Fugitive Emissions to Total Methane Emissions in CO, UT, and TX Using Mobile Isotopic Methane Analysis Based on Cavity RingDown Spectroscopy (CRDS) <i>Chris W. Rella (Picarro Inc., Santa Clara, CA)</i>	43
15:45 - 16:00	Mapping Sources of Methane Emissions Over the Barnett Shale in Texas <i>Bill Hirst (Shell Global Solutions International BV, The Hague, The Netherlands)</i>	44
16:00 - 16:15	Measurements and Modeling of Greenhouse Gases and the Planetary Boundary Layer (PBL) for the Boston Metro Area and the Northeastern Megalopolis <i>Philip DeCola (Sigma Space Corporation, Lanham, MD)</i>	45
16:15 - 16:30	Modeling of Atmospheric Methane and Ozone in the Uintah Basin, UT: The Role of Oil and Gas Emissions, Chemistry and Transport <i>Ravan Ahmadov (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)</i>	46
16:30 - 16:45	Anatomy of Wintertime Photochemical Ozone Production: Uintah Basin, UT, 2013 <i>Russ C. Schnell (NOAA Earth System Research Laboratory, Boulder, CO)</i>	47
• 16:45	Closing Remarks - Dr. James Butler, Director (NOAA/ESRL Global Monitoring Division)	

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Tuesday, May 20, 2014 17:00 - 20:00 POSTER SESSION AGENDA

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• *International Stations & Partners*

- P-1 Halley – A Recently Established Global Atmospheric Watch (GAW) Global Atmospheric Research Station in Antarctica - Preliminary Results from Greenhouse Gas Measurements
Neil Brough (British Antarctic Survey, Cambridge, United Kingdom)
- P-2 Experimental Studies of Carbon Monoxide Based on Measurements in the Antarctic (Novolazarevskaya Station)
Felix Kashin (Federal State Budgetary Institution Research and Production Association "Typhoon", Obninsk, Russia)
- P-3 The Dr. Neil Trivett Global Atmosphere Watch (GAW) Observatory at Alert, Nunavut: Program Highlights from a Decade of Collaborative Atmospheric Research
Andrew Platt (Environment Canada, Climate Research Division, Atmospheric Science Technology Directorate, Science Technology Branch, Toronto, Ontario, Canada)
- P-4 Comparison of NOAA Near-surface Temperatures and MODerate-resolution Imaging Spectroradiometer (MODIS) Ice-Surface Temperatures (IST) at Summit, Greenland
Thomas Mefford (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-5 Recent Measurements from the Cape Verde Atmospheric Observatory (CVAO)
Shalini Punjabi (University of York, York, United Kingdom)
- P-6 Long-term Measurements of Solar Radiation and Aerosol Optical Depth at Mt. Lulin (2,862m) in East Asia
Sheng-Hsiang Wang (National Central University, Department of Atmospheric Sciences, Chung-Li, Taiwan)
- P-7 CO₂, CH₄, and Stable Isotopes at Lulin and Dongsha Island, Taiwan
Chang-Feng Ou-Yang (National Central University, Department of Atmospheric Sciences, Chung-Li, Taiwan)

• *Radiation*

- P-8 A Miniature Upward-looking Radiometer for Balloon and Unmanned Aerial Vehicle (UAV) Use
Ru-Shan Gao (NOAA Earth System Research Laboratory, Boulder, CO)
- P-9 Update of the Mauna Loa Clear-sky Atmospheric Solar Transmission 1958 – 2013
Kathleen Lantz (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-10 Brewer 131 Calibration at 4-corners New Mexico Environment Department Site: Measurement and Calibration Issues
Patrick Disterhoft (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-11 Improved Quality Assurance Procedures for the Antarctic and U.S. Ultraviolet Monitoring Program
Patrick Disterhoft (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)

• *Halocarbons*

- P-12 NOAA Global Monitoring Division SkyWisp
Fred L. Moore (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-13 Recent Results from the Airborne Tropical Tropopause EXperiment (ATTREX) Over the Western Tropical Pacific
Eric Hintsa (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-14 How Much Can We Learn About Nitrous Oxide Emissions from Background Sites and Simple Box Models?
James W. Elkins (NOAA Earth System Research Laboratory, Boulder, CO)
- P-15 Global Measurement of Nitrous Oxide and Its Stable Isotopes Using Cavity Ring-down Spectroscopy
Amy Steiker (Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO)
- P-16 Improvement and Additions to the Halocarbons & Other Atmospheric Trace Species Group (HATS) Combined Data Sets
Geoff Dutton (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-17 Atmosphere-based Estimates of Non-CO₂ Greenhouse Gas Emissions for the U.S. Derived from ¹⁴CO₂
Steve Montzka (NOAA Earth System Research Laboratory, Boulder, CO)

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• **Carbon Cycle & Greenhouse Gases**

- P-18 What We Learn from Updates of NOAA'S Annual Greenhouse Gas Index (AGGI)
James H. Butler (NOAA Earth System Research Laboratory, Boulder, CO)
- P-19 Environment Canada's Greenhouse Gases Measurement Program - Summary of Progress to 2014
Doug Worthy (Environment Canada, Toronto, Ontario, Canada)
- P-20 A New Reference Scale for Measurements of Carbon Monoxide in the Atmosphere
Paul C. Novelli (NOAA Earth System Research Laboratory, Boulder, CO)
- P-21 Meteorological Controls on the Diurnal Variability of Carbon Monoxide at Pinnacles, an East Coast Mountaintop Site in the CarbonTracker Observational Network
Stephan F. J. De Wekker (University of Virginia, Charlottesville, VA)
- P-22 A Central Facility for Greenhouse Gas Analyses Within the Integrated Carbon Observation System (ICOS) Research Infrastructure
Daniel Rzesanke (Max Planck Institute (MPI) for Biogeochemistry, ICOS Flask & Calibration Laboratory (FCL), Jena, Germany)
- P-23 Regional Carbon Cycle and Atmospheric Inversions in the Southeastern United States (U.S.) – Optimizing an Observational Network
Scott Richardson (The Pennsylvania State University, University Park, PA)
- P-24 Bayesian Optimization of the Net Ecosystem Exchange (NEE) in Oregon Using a New CO₂ Observation Tower Network, Transport Modeling, and the Community Land Model
Andres Schmidt (Oregon State University, Corvallis, OR)
- P-25 Quantification of Transport Errors in Regional CO₂ Inversions Using a Physics-based Ensemble of Weather Research & Forecast (WRF)-Chem Simulations
Liza I. Diaz Isaac (The Pennsylvania State University, Department of Meteorology, University Park, PA)
- P-26 Comparing Modeled Column-average CO₂ to Greenhouse Gases Observing SATellite (GOSAT) Atmospheric CO₂ Observations from Space (ACOS) 3.4 X_{CO₂} Product
Andrew Schuh (Colorado State University, Cooperative Institute for Research in the Atmosphere (CIRA), Fort Collins, CO)
- P-27 Improving CO₂ Air-sea Fluxes by Combining O₂ and CO₂ Data
Laure Resplandy (Scripps Institution of Oceanography, La Jolla, CA)
- P-28 Estimating Fire Emissions Using Visible Infrared Imaging Radiometer Suite (VIIRS) Nightfire Data and the Fire INventory from NCAR (FINN)
Tom Oda (Colorado State University, Cooperative Institute for Research in the Atmosphere (CIRA), Fort Collins, CO)
- P-29 Evidence of Causality Between the Atmospheric Concentration Levels of Carbon Dioxide and Temperature
Kevin F. Forbes (The Catholic University of America, Washington, DC)
- P-30 As Methane Concentration Goes Up, Stable Isotopes of Methane Go Down: ¹³C Implicates a Microbial Source Across Latitudinal Gradients
Sylvia Englund Michel (Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO)
- P-31 Comparison of *In Situ* and Discrete Sample Methane Monitoring at Summit, Greenland
Reed M. Terrell (Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO)

• **Oil & Gas Fields**

- P-32 Top-down Constraint on Hydrocarbon Emissions in the Denver-Julesburg Oil and Natural Gas Basin
Gabrielle Petron (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-33 Initial Results of a Natural Gas Methane Emissions Survey in California's Southern San Joaquin Valley
Marc L. Fischer (Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division, Berkeley, CA)
- P-34 Effect of Oil and Gas Development on Atmospheric Levels of Hydrocarbons and Tropospheric Ozone
So-Yun Kim (Fairview High School, Boulder, CO)

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• Networks & Data Management

- P-35 Bridging the Work of Field Scientists and the Needs of Data Re-users
Antonia Rosati (National Snow and Ice Data Center (NSIDC), Boulder, CO)
- P-36 The National Ecological Observatory Network (NEON): Overview and Strategies for Managing Thousands of Simultaneous Measurements Across the Continent
Jeffrey Taylor (National Ecological Observatory Network (NEON), Boulder, CO)
- P-37 The National Ecological Observatory Network (NEON) Mobile Deployment Platform (MDP): A Flexible Community Resource for Ecological Research
Michael SanClements (National Ecological Observatory Network (NEON), Boulder, CO)
- P-38 Global Emissions Initiative's (GEIA) Vision for Improved Emissions Information
Gregory J. Frost (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)

• Aerosols

- P-39 Monitoring Aerosol Optical Depth During the Arctic Night: Development of a Lunar Photometer for Use at the NOAA Barrow Observatory
James Wendell (NOAA Earth System Research Laboratory, Boulder, CO)
- P-40 Results of Aerosol Hygroscopicity During The Two-Column Aerosol Project (TCAP) Campaign in the Frame of the NOAA Network
John A. Ogren (NOAA Earth System Research Laboratory, Boulder, CO)
- P-41 Black Carbon in the Arctic: In the Arctic Report Card
Sangeeta Sharma (Environment Canada, Climate Research Division, Atmospheric Science Technology Directorate/Science & Technology Branch, Toronto, Ontario, Canada)

• Ozone & Water Vapor

- P-42 Observational Evidence for Incomplete Dehydration in the Tropical Tropopause Layer
Andrew Rollins (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-43 The Stratospheric Water and OzOne Satellite Homogenized (SWOOSH) Data Set
Sean Davis (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-44 Towards a Combined Infrared Atmospheric Sounding Instrument (IASI)/Tropospheric Emission Spectrometer (TES) Record of Ozone: Validation and First Results
Hilke Oetjen (Joint Institute for Regional Earth System Science and Engineering (JIFRESSE) UCLA/Jet Propulsion Laboratory (JPL), Los Angeles, CA)
- P-45 South Pole Ozonesonde Measurements During the 2013 Ozone Hole
Bryan Johnson (NOAA Earth System Research Laboratory, Boulder, CO)
- P-46 The Implications of Background O₃ Affecting the Setting and Attainment of the National Ambient Air Quality Standards (NAAQS) for Surface O₃
Samuel J. Oltmans (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)
- P-47 Colorado Front Range Surface Ozone Characterization
Audra McClure-Begley (Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO)