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IGACnews

facilitating atmospheric chemistry research towards a sustainable world

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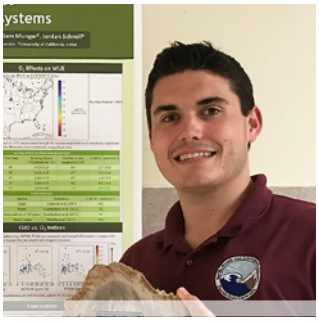
2016 IGAC Science Conference Early Career Presentation Awardees

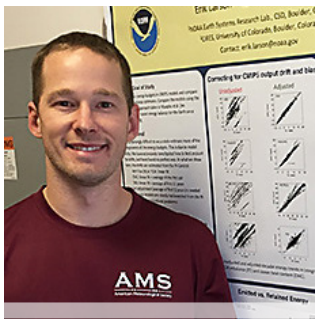
Health Impacts
Sara Fenech



Water Use Efficiency
Jason Ducker

Methane Attribution
Ingrid Mielke-Maday

MSA Formation
Rebecca Simpson



Earth's Energy Budget
Erik Larson

CO_2 Variability in Mexico
Jorge Luis Baylon Cardiel

Deforestation Impacts
Catherine Scott

» *See page 20 for more information and abstracts*

contents

departments

igac event summaries

early career scientist profiles

open submissions

On the Cover

Early Career Presentation Award Winners at 2016 IGAC Science Conference in Breckenridge, CO, USA

Editor: Megan L. Melamed
Newsletter Design: Allison Gray

IGAC was formed in 1990 to address growing international concern over rapid changes observed in Earth's atmosphere. IGAC operates under the umbrella of Future Earth and is jointly sponsored by the international Commission on Atmospheric Chemistry and Global Pollution (iCACGP). The IGAC International Project Office is hosted by the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado and is sponsored by the US National Science Foundation (NSF), National Oceanic and Atmospheric Association (NOAA), and National Aeronautics and Space Administration (NASA). Any opinions, findings, and conclusions or recommendations expressed in this newsletter are those of the individual author(s) and do not necessarily reflect the views of the responsible funding agencies.

This is Why My Job is Rewarding

As you will read in this issue of IGACnews, IGAC recently had its annual Scientific Steering Committee (SSC) meeting, the first IGAC Early Career Short Course, and the biennial IGAC Science Conference in Breckenridge, CO, USA. These three events epitomize why I find my job as the IGAC Executive Officer so rewarding.

The annual IGAC SSC meeting is always a highlight for me. Serving on the IGAC SSC is a volunteer position and I ask a lot of the SSC members in order to ensure IGAC is truly guided by its SSC and represents the international atmospheric chemistry community. The 2016 IGAC SSC meeting clearly demonstrated the commitment of both the current and incoming SSC members to IGAC's mission and vision. I am very grateful to the current SSC as well as to all the people that have served on past SSCs for making IGAC a successful organization.

As an early career scientist, I had the opportunity to partake in both the Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) and the DISsertations initiative for the advancement of Climate Change ReSearch (DISCCRS). These two opportunities helped me to create research networks and collaborations that have and continue to enhance my career. Providing these kinds of opportunities for other early career scientists from across the world was my personal motivation to hold the first IGAC Early Career Short Course this year. From speaking with the various participants of the short course, I believe the 36 selected participants from 19 different countries were also able to form relationships, and begin to create networks and think about future collaborations. Although the networks and collaborations may take years to come to fruition, the short course, I believe, planted a seed that will make the international IGAC community stronger in the future.

The IGAC Science Conference is a unique opportunity for me to see that IGAC is truly fostering an international community of atmospheric scientists that is providing collaborative scientific research to address some of the most pressing global change and sustainability issues. Seeing ~500 scientists from 36 different countries around the world share their scientific research, talk for hours about science at various social events, and even dance late into the night to a wide array of music brings a huge smile to my face.

I hope you will all join us in 2018 for the joint 14th iCACGP Symposium/15th IGAC Science Conference in Takamatsu, Kagawa, Japan. I'll be there with a huge smile on my face. IGAC

MEGAN L. MELAMED
IGAC Executive Officer
megan@igacproject.org

Megan Melamed received her PhD in 2006 in Environmental Engineering from the University of Colorado. She then received the National Science Foundation International Research Fellowship to work at the Universidad Nacional Autónoma de México (UNAM) in Mexico City for two years. Upon completion of the NSF Fellowship, Megan became an American Association for the Advancement of Science (AAAS) Science & Technology Policy Fellow at the U.S. Environmental Protection Agency. She has been the IGAC Executive Officer since January 2011.

In Memoriam, Ralph Cicerone
(1943-2016)

Ralph Cicerone was not only a great atmospheric scientist and leader to the scientific community, he also played a pivotal role in forming IGAC in the 1980's. Along with Bob Duce, Ralph co-chaired a 1984 NRC Report on "Global Tropospheric Chemistry", which recommended the US support an international research effort on the chemistry of the global troposphere. This provided the foundation for IGAC to become an international research project supported by the U.S. NSF, NASA, and NOAA.

The below tribute to Ralph Cicerone was released by the National Academy of Sciences on 5 November 2016, **link to website**:

National Academy of Sciences President Emeritus Ralph J. Cicerone – a leader of science and world-renowned authority on atmospheric chemistry and climate change – died at his home in New Jersey on November 5. He was 73.

Cicerone served as the 21st president of the National Academy of Sciences from July 1, 2005 to June 30, 2016. Throughout his tenure, Cicerone was a steady voice for science in Washington, always maintaining a civilized and respectful dialogue with politicians and policymakers on some of the most challenging and controversial scientific issues of our time. At the same time, he remained a strong advocate for independent scientific advice – the hallmark of the Academy since its founding in 1863 – to inform government decision-making and public discourse.

His significant milestones and accomplishments include the restoration and renovation of the historic National Academy of Sciences building on the National Mall, the creation of a $500 million Gulf Research Program following the Deepwater Horizon disaster, two visits to NAS by President Obama, and a number of influential studies that helped to define the causes, extent, and effects of global climate change.

"The entire scientific community is mourning the sudden and untimely loss of this great leader who has been unexpectedly removed from the forefront of the scientific issues that matter most to the future well-being of society," said Marcia McNutt, Cicerone's successor as president of the National Academy of Sciences. "Ralph Cicerone was a model for all of us of not only doing what counts, but doing it with honesty, integrity, and deep passion."

Cicerone was an atmospheric scientist whose research placed him at the forefront in shaping science and environmental policy, both nationally and internationally. In 2001, he led a key National Academy of Sciences study about climate change requested by President George W. Bush. Ten years later, under Cicerone's leadership, a comprehensive set of reports titled *America's Climate Choices*, which called for action on reducing greenhouse gas emissions while identifying strategies to help the nation and world adapt to a changing climate, were issued. Under Cicerone's guidance, the NAS and the Royal Society – the science academy of the U.K. – teamed up in 2014 to produce *Climate Change: Evidence and Causes*, a readable publication written for policymakers, educators, and members of the public.

Engaging the general public in science was a major priority for Cicerone, who spearheaded the creation of the NAS's Science & Entertainment Exchange. This unique program connects entertainment industry professionals in Hollywood with top scientists and engineers to assist in the portrayal of science in film and TV. He also worked on developing the widely cited 2008 book *Science, Evolution and Creationism*, which laid out the scientific evidence supporting evolution in a readable way for many audiences.

Helping scientists probe and understand the promise and potential problems posed by powerful emerging technologies like gene editing also was a priority for Cicerone. In 2015, he had a leading role in convening an international summit to explore the many issues raised by the arrival of a new class of genetic tools (such as *CRISPR/Cas 9*) for potential use in transforming humans, plants, and animals.

Within the NAS, Cicerone's initiatives demonstrated his commitment to maintaining the institution's relevance in a rapidly changing world – while still upholding its values of independence and excellence. Under his leadership, the NAS focused on increasing the number of women, minorities, and younger scientists elected to its membership. Cicerone also spoke out publicly for the need to maintain integrity and transparency in research. In his frequent visits and consultations with members of Congress, key Hill staffers, and federal agency heads, he spoke out on behalf of science and science education.

Prior to his election as president of the Academy, Cicerone served as chancellor of the University of California, Irvine from 1998 to 2005. He received a number of honorary degrees and many awards in recognition of his scientific work. He earned a B.S. degree in electrical engineering from the Massachusetts Institute of Technology, where he was a varsity baseball player. His M.S. and Ph.D. degrees in electrical engineering, with a minor in physics, were from the University of Illinois at Urbana-Champaign. Cicerone is survived by his wife Carol M. Cicerone, their daughter, and two grandchildren.

Thank you, IGAC Co-Chair Allen Goldstein!

Allen Goldstein from the University of California – Berkeley, USA served on the IGAC Scientific Steering Committee (SSC) as a member from 2009-2012 and then as co-chair from 2013-2016. As co-chair, Allen guided IGAC through the transition from being a core project of IGBP to a research project of Future Earth making sure the focus of IGAC remained on fundamental atmospheric chemistry research. Allen has a keen ability to see the larger picture of IGAC's role within the atmospheric chemistry community and played a key role in developing IGAC's mission statement and vision diagram. He also co-authored a synthesis article on IGAC that summarized IGAC's role in facilitating atmospheric chemistry research for the past 25 years. As a member, Allen served as the co-chair of the Scientific Program Committee for the 2012 IGAC Science Conference in Beijing, China. His influence and impacts on IGAC will continue to be present for years to come. On behalf of the entire IGAC community, we thank Allen for his years of service and leadership on the IGAC SSC.

IGAC Welcomes Hiroshi Tanimoto as the new IGAC Co-Chair

Hiroshi Tanimoto from the National Institute for Environmental Science (NIES), Japan will replace Allen Goldstein as co-chair of the IGAC SSC starting January 2017. Hiroshi has served on the IGAC SSC as a member since 2012 and has a played a key role in bringing together the Asian atmospheric chemistry community as co-chair of the IGAC Monsoon Asian and Oceania Networking Group (MANGO). In addition, Hiroshi has contributed to numerous IGAC activities and is chair of the local organizing committee for the 2018 joint 14th Quadrennial iCACGP Symposium/ 15th IGAC Science Conference. IGAC welcomes Hiroshi into his new role as the co-chair of IGAC and looks forward to his leadership.

IGAC Says Goodbye to Three SSC Members

At the end of 2016, IGAC will sadly say goodbye to three excellent IGAC SSC members: **Claire Granier** from LATMOS, France; **Melita Keywood** from CSIRO, Australia; and **Yinon Rudich** from the Weizmann Institute, Israel. Claire Granier fulfilled many roles within IGAC including, but not limited to, her leadership and continued support of the Global Emissions Initiative (GEIA), representing the Chemistry-Climate Model Initiative (CCMI), serving as the liaison to the Stratospheric-tropospheric Processes And their Role in the Climate (SPARC) World Climate Research Programme (WCRP) project, and most recently her role as the co-chair of the Scientific Program Committee for the 2016 IGAC Science Conference. Melita Keywood helped with the formation of IGAC MANGO making

sure to enhance the links between Southeast Asia and Oceania and as a leader in biomass burning research she served as co-chair of the Interdisciplinary Biomass Burning Initiative (IBBI). Yinon Rudich provided significant contributions to Fundamentals of Atmospheric Chemistry and he also served as the co-chair of the Scientific Program Committee for the 2014 joint 13th Quadrennial iCACGP Symposium/13th IGAC Science Conference in Natal, Brazil. Although IGAC will miss the participation of these scientists as part of the SSC, IGAC looks forward to their continued involvement in IGAC activities and science conferences for years to come.

IGAC Welcomes Three New SSC Members

As of January 2017, IGAC is pleased to welcome the following three scientists to its scientific steering committee.

Gregory Frost

Gregory Frost is a Research Chemist at NOAA's Earth System Research Laboratory in Boulder, Colorado, USA. After receiving a PhD in physical chemistry from the University of Colorado (CU) at Boulder in 1995, he started work at NOAA as a National Research Council postdoctoral fellow. From 1997 to 2014, Frost was also a Research Scientist with CU's Cooperative Institute for Research in Environmental Sciences. Frost's research uses atmospheric observations and modeling to understand emissions and tropospheric chemistry and their impacts on air quality and climate change. Frost co-chairs the Global Emissions InitiAtive (GEIA), the emissions and chemical processes working group of NASA's Geostationary Coastal and Air Pollution Events (GEO-CAPE) science team, and the Inverse Modeling of Emissions Assessment. He serves on the science team for the Fire Influence on Regional and Global Environments Experiment (FIREX), the steering committee of the Community Emissions Data System (CEDS), and the advisory board of the Emissions of Atmospheric Compounds and Compilation of Ancillary Data (ECCAD) project. He is an associate editor for the *Journal of Geophysical Research – Atmospheres* and an editor for the journal *Atmospheric Chemistry and Physics*.

Christian George

Dr. Christian George (Ph. D. in the field of Physical-Chemistry - 1993, Habilitation in Chemistry - 1999, University Louis Pasteur - Strasbourg) has been active in the field of atmospheric chemistry and/or physical chemistry over the last decade. He acted as research scientist at the Fraunhofer Institute ITA at Hanover (Germany), at the CNRS Centre for Surface Geochemistry at Strasbourg (France) and now at CNRS-IRCELYON (France). Especially, he actively participated in projects focused on understanding multiphase transformation in the atmosphere.

Clare Murphy

Clare Murphy is currently an Associate Professor in Physical Chemistry at the University of Wollongong, Australia in the School of Chemistry. She began her scientific career in 1990 as a "Scientific Officer" for the Radioactivity Group at the National Physical Laboratory (NPL) in the UK. In 1994, Clare moved to the Environmental Standards Group in the analytical Science Team at NPL to help in the European research efforts to determine the extent of stratospheric ozone depletion in the northern polar regions. Her research involved solar remote sensing of atmospheric trace gases using Fourier transform spectroscopy as part of the Network for Detection of Atmospheric Composition Change. In 2002, Clare moved to Australia to work as a research scientists at the University of Wollongong in the Centre for Atmospheric Chemistry and began her doctorate work in 2004 at the same University. Upon completion of her Ph.D. in 2009, Clare became a lecturer in Physical Chemistry at the University of Wollongong. She continues her research in solar remote sensing of atmospheric trace gases, has been involved in a number of satellite validation exercises, and has broadened her research interests to include ground level atmospheric composition with a focus on fires and air quality.

Save the Date

2018 joint 14th Quadrennial iCACGP Symposium/15th IGAC Science Conference
25-19 September 2018
icacgp-igac2018.org

Chemistry-Climate Model Initiative (CCMI) Special Issue

Submissions are now being accepted for the joint ACP/AMT/ESSG/GMD special issue entitled "Chemistry-Climate Model Initiative (CCMI)

Submit articles to the next IGAC News

IGAC is now accepting article submissions for the next IGACnews. Workshop Summaries, Science Features, Activity News, and Editorials are all acceptable and desired. Science Features should have an approximate length of 1500 words with 1-2 images. All other submissions should be approximately 500 words and have 1-2 images. Please provide high-resolution image files. The deadline for submissions for the Mar/Apr issue of the IGACnews is 15 March 2017. Send all submissions to **info@igacproject.org**.

IGAC ON SOCIAL MEDIA

IGAC is on LinkedIn, Twitter and Facebook in an effort to further advance international scientific cooperation and serve as a resource to the public, especially you. Please join us to stay apprised of the most current news on conferences, workshops and publications. Let us hear from you on how to improve the international conversation, **@IGACProject**.

31st Annual IGAC SSC Meeting

24 – 25 SEPTEMBER 2016
BRECKENRIDGE, CO, USA

IGAC Sponsored

AUTHORS
Mark Lawrence, Institute for Advanced Sustainability Studies, Germany
Allen Goldstein, University of California - Berkeley, USA

HOST INSTITUTION

University of Colorado Boulder

IASS POTSDAM

CIRES Cooperative Institute for Research in Environmental Sciences

FUNDING

futureearth

PARTICIPANTS
Australia, Brazil, Canada, China, France, Germany, Greece, India, Japan, Mexico, South Africa, Switzerland, Thailand, United Kingdom, and United States.

BACKGROUND
IGAC's priorities and activities are guided and, in many cases, implemented by an international Scientific Steering Committee (SSC). Currently the IGAC SSC consists of 18 members from around the world (current membership list at **igacproject.org/SSC**).

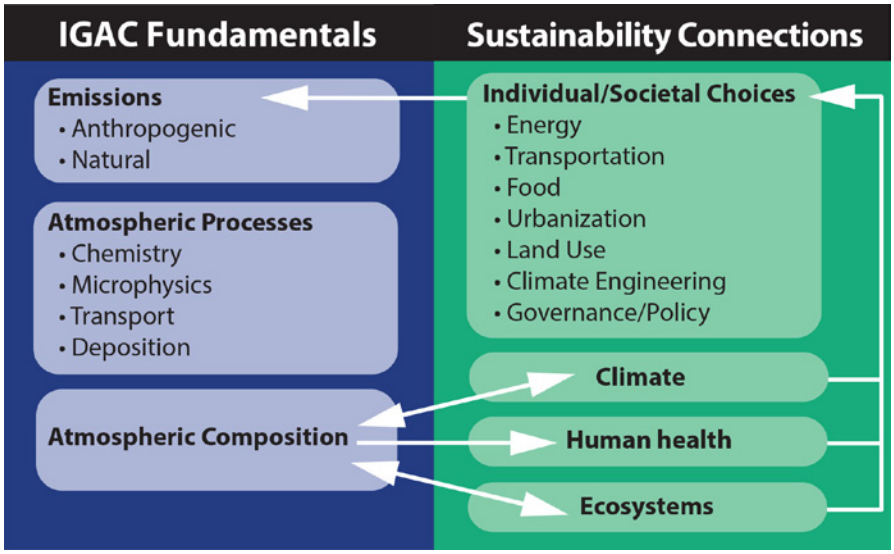
Participants of the 2016 IGAC SSC Meeting

Eighteen SSC members along with liaisons from other organizations gathered to discuss the ongoing activities, recent successes, and future plans of the highly-active international IGAC community. IGAC is now firmly operating within its new branding, working in three main categories – "Fostering Community", "Building Capacity", and "Providing Leadership" – in order to fulfill its mission; "Facilitating atmospheric chemistry research toward a sustainable world". As part of this new branding, the SSC discussed an update to its logo, which is still under consideration.

One of the most important contributions of IGAC to the community is its biennial Science Conference, which every other time is held jointly with the Quadrennial iCACGP Symposium. An overview was given for the plans for the 2016 Conference in Breckenridge, Colorado, and an introduction was given to the venue for the 2018 joint 14th Quadrennial iCACGP Symposium/15th IGAC Conference in Takamatsu, Kagawa, Japan.

Activities are a core aspect of IGAC (see **igacproject.org/currentactivities**), as are several national/regional working groups (see igacproject.org/workinggroups). Updates were presented for all of IGAC's activities and working groups. As part of a new procedure, the SSC now conducts reviews of selected activities and working groups each year, with generally a 3-year rotation cycle among the activities and working groups. This year, IBBI, PACES, SPARTAN, and Fundamentals of Atmospheric Chemistry activies, and the China Working Group and Japan National Committee were reviewed. The progress within all of the reviewed projects and working groups was generally seen very positively. World Café sessions were used to gather feedback on the individual projects and working groups, which was followed up by online voting by the SSC members to determine which activities and working groups IGAC will continue, sponsor, or endorse. Feedback from the SSC meeting the follow-up survey has been provided to the activity and working group leaders.

One broadly relevant feedback was on the Fundamentals activity. This activity officially began in 2012, quickly developing into a "catch-all"



IGAC Vision Diagram

activity providing a general home for many topics like lab research and *in situ* measurements, and has served to garner interest in community-building through many sponsored and endorsed workshops. The SSC came to realize that Fundamentals are central to a broad range of core topics addressed by IGAC rather than being characteristic of an IGAC activity. Thus, a decision was made to modify the IGAC Vision diagram to clarify its central role, relabeling the left side "IGAC Fundamentals", rather than "IGAC Core Activities", and to add a statement about the central role of Fundamentals in IGAC on our website.

The SSC then had very fruitful discussions with liaisons from our sponsors, namely iCACGP and Future Earth. We see this joint sponsorship as fitting well to our IGAC vision, with iCACGP particularly partnering on our IGAC Fundamentals, while Future Earth is particularly partnering on our Sustainability Connections. We appreciate the long-term collaboration and support from iCACGP, and we see joining Future Earth as a genuine opportunity for the international atmospheric chemistry community to enhance connections between strong laboratory, field and modeling studies on emissions, atmospheric processes and atmospheric composition and the larger Earth system research community. Through Future Earth, IGAC can promote international collaborations and co-design the scientific knowledge required to respond effectively to the challenges and opportunities of global environmental change and sustainability.

This was followed up by very positive presentations by and discussions with collaborators from other global research projects within and outside Future Earth. Liaisons from the following Future Earth global research projects were present: Integrated Land Ecosystem-Atmosphere Process Study (iLEAPS); Urbanization and Global Environmental Change (UGEC); and oneHEALTH. In addition, liaisons from the World Climate Research Program (WCRP) Stratospheric-tropospheric Processes And their Role In Climate (SPARC) and the World Meteorological Organization (WMO) Global Atmosphere Watch (GAW) program were present.

Looking to the future, IGAC discussed the new U.S. NAS Report "The Future of Atmospheric Chemistry", which provides very valuable input and structuring that is useful for the broader IGAC community. We also discussed four proposals for new IGAC Activities/Working Groups:

- Emerging Activity on Atmospheric Chemistry in Cold Regions
- MAP-AQ
- Inverse Modeling Assessment
- ACPC (Atmospheric Clouds, Precipitation and Chemistry)

The meeting closed with a discussion of the location for the 2017 IGAC SSC meeting: Wollongong, Australia.

The IGAC SSC then spent the next five days enjoying the 2016 IGAC Science Conference. The SSC would like to say thank the local organizing committee (Chair: Christine Wiedinmyer), the scientific program committee (Co-Chairs: Claire Granier and Hiroshi Tanimoto), the early career organizing committee (Co-Chairs: Sarah Monks and Steven Brey), and the numerous sponsors for making the conference such a success.

The next IGAC Science Conference will be held jointly with the Quadrennial iCACGP Symposium, September 25-29, 2018, in Takamatsu, Kagawa, Japan. We look forward to welcoming many of you there as we come together again to hear about the latest and greatest in the field of Atmospheric Chemistry.

26-30 SEPTEMBER 2016
BRECKENRIDGE, CO, USA

IGAC Sponsored

14th IGAC Science Conference

AUTHORS

Christine Wiedinmyer, Chair of Local Organizing Committee
Jill Reisdorf, Local Organizing Committee
Claire Granier, Co-chair of Scientific Program Committee
Hiroshi Tanimoto, Co-chair of Scientific Program Committee
Sarah Monks, Co-chair of Early Career Organizing Committee
Steven Brey, Co-chair of Early Career Organizing Committee

HOST INSTITUTIONS

SPONSORS

Conference Participants

We are pleased to report on the success of the 14th IGAC Science Conference in Breckenridge, CO, USA, this past September. The conference, with the theme "One Atmosphere: Building a Collective Knowledge", provided a great platform for exchanging information and new ideas on the current scientific knowledge on atmospheric chemistry and its connections to climate change, policy, and other important interdisciplinary work. Overall the conference was a huge success with 494 participants representing 36 different countries. Early career scientists represented 40% of the conference attendees, highlighting vibrant and active research.

The conference took place in the beautiful mountain town of Breckenridge, Colorado. The weather was gorgeous, and conference attendees had opportunities to not only experience world-class research, but also exceptional scenery and even wildlife.

PARTICIPANTS

Argentina, Australia, Azerbaijan, Bangladesh, Bolivia, Brazil, Canada, Chile, Columbia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Italy, Japan, Kenya, Korea, Mexico, Netherlands, New Zealand, Norway, Pakistan, Puerto Rico, Singapore, Slovenia, South Africa, Sweden, Switzerland, Thailand, United Kingdom, and United States.

BACKGROUND

IGAC's biennial Science Conference is the primary mechanism for IGAC to disseminate scientific information across its international community. The first IGAC Science Conference was held in 1993 in Eilat, Israel. Since then, IGAC has successfully held fourteen science conferences (**igacproject.org/igac-conferences**).

Beaver Run Resort, Breckenridge, CO, USA

The six scientific sessions of the conference were designed to foster discussions and inspire participants on future endeavors on important fundamental atmospheric chemistry research as well as impacts and connections with other components of the Earth system:

Session 1: Atmosphere chemistry and urbanization

Session 2: Atmospheric chemistry, ecosystems and agriculture

Session 3: Atmosphere chemistry and energy

Session 4: Atmospheric chemistry and fundamental studies

Session 5: Atmospheric chemistry and climate change

Session 6: Atmospheric chemistry – observing composition and variability

In addition to the 12 invited speakers and 50 oral presentations in the aforementioned sessions, three keynote addresses were also given by Allen Goldstein, Maria Kanakidou, and David Fahey on the future of atmospheric chemistry, aerosols in atmospheric chemistry and biogeochemical cycles, and Earth observations and modeling for decision making, respectively. Dr. Marcelo Mena, Vice Minister of Environment, Chile, also gave a presentation highlighting real-world intersections between atmospheric chemistry science and policy. In addition to the plenary oral presentations, 367 posters were presented throughout the week.

The Technology Special Session was a popular addition to this year's IGAC Conference. Seven companies working in atmospheric sensing technology made short presentations about their instruments and were available to answer questions at tabletop exhibits. In all, 21 international industry and scientific community sponsors participated in the conference.

Special banquet speaker, Jenn Vervier, Director of Strategy & Sustainability at New Belgium Brewery, shared the amazing story of how a local microbrewery started in a Colorado basement became an industry leader in environmental awareness and sustainability.

The Early Career Program took place throughout the week with several special events dedicated to building collaborations and relationships between IGAC early career scientists (ECS). An evening social event and group hikes in the beautiful surroundings around Breckenridge gave ECS a chance to meet their peers from around the world in an informal setting. A networking lunch with more than 50 established scientists aided ECS in making connections with more senior scientists, whilst lunchtime seminars given by Future Earth, Earth Science Women's Network (ESWN) and the Young Earth System Scientists (YESS) Community provided insight into opportunities to get involved in programs outside of the ECS immediate research areas. As is tradition, ECS took part in the Early Career Poster and Oral Presentation awards. A very high standard of science being produced by the ECS was reflected in the comments received from the judges.

This issue of IGACnews features the winners of the Early Career Poster and Oral Presentation competition. Please read on to learn more about the future leaders in atmospheric chemistry research.

Thank you to the entire IGAC community for making the 2016 conference a success. More information on the conference can be found at **igac2016.org**.

2016 IGAC Early Career Short Course

23-25 SEPTEMBER 2016
BOULDER and BRECKENRIDGE, COLORADO, USA

IGAC Sponsored

AUTHORS
Sarah Monks, NOAA, USA
Steven Brey, Colorado State University, USA
Fatimah Ahamad, Universiti Kebangsaan Malaysia
Julian Gelman Constantin, CNEA, Argentina
Kerneels Jaars, North-West University, South Africa

HOST INSTITUTIONS

FUNDING

PARTICIPANTS

Argentina, Brazil, China, Colombia, Côte d'Ivoire, Denmark, Finland, France, Germany, India, Israel, Japan, Malaysia, Pakistan, Puerto Rico, South Africa, Switzerland, United Kingdom, United States.

BACKGROUND

At the 2014 joint iCACGP Symposium/ IGAC Science Conference in Natal, Brazil, a half-day course was held for all early career scientist to introduce them to the topics of the scientific sessions. Based on the input from this half-day course, IGAC decided to hold the first IGAC Early Career Short Course for three days prior to the 2016 IGAC Science Conference.

IGAC Short Course Participants

Thirty-six scientists representing 19 countries recently gathered in the cities of Boulder and Breckenridge, CO, USA, for the first 2016 IGAC Early Career Short Course (ECSC). The 36 participants engaged in an intensive three-day short course with content varying from communication skill development to exploring the science-policy landscape. The main goal of the short course was to foster friendship and collaboration among the future leaders of atmospheric chemistry research. Investing in future leaders is a vital part of the IGAC mission to foster international atmospheric chemistry research towards a sustainable world. Applications to attend the ECSC far outpaced the number of available spots. Many worthy applicants had to be turned away.

The core themes of the 2016 IGAC ECSC were modern science, science communication and science policy engagement, making your science impactful, and developing mentoring skills. Highlights from each of these activities and the broader impacts are discussed below.

The modern science session began with tours of the NOAA Chemical Science Division (CSD) in Boulder, Colorado. While touring state of the art science labs, ECSC participants were able to meet with some of the current leaders in atmospheric chemistry research. Conversations ranged from the extremely technical (i.e., how small can you make an optical aerosol instrument) to the very broad (i.e., how should you choose to do

the science you do). Later in the day during the tours of the NCAR Research Aviation Facility (RAF) you could almost hear the sound of people writing proposals in their heads as the participants explored the NSF/NCAR C-130 and GV aircrafts. The excitement and inspiration of touring these facilities (including the NCAR Mesa Lab) while spending time with the scientists who run them had a visible impact on the group.

The second day of the short course was spent participating in a science communication and science-policy engagement module developed by Erika von Schneidemesser (IASS, Germany), Julia Schmale (PSI, Switzerland) and Heather Mannix (Compass, USA). The module helped early career participants frame scientific messages for various audiences, focusing on finding appropriate language and understanding to the goals of each audience. After honing in our messages, participants discussed our role as scientists and the ethics of scientific advocacy. Also, panel discussion allowed participants to gain the perspective of those already involved in science policy engagement. Later, different ways to engage in the science-policy landscape were explored and participants developed personal action plans to reach personal goals in science policy engagement.

36 participants engaged in an intensive three-day short course with content varying from communication skill development to exploring the science-policy landscape. The main goal of the short course was to foster friendship and collaboration among the future leaders of atmospheric chemistry research.

The final day of the short course focused on making science impactful and developing leadership skills. The impactful science session was led by A.R. Ravishankara, Colorado State University, USA. During the impactful science session, we discussed a classification of different kinds of science, in relation with the relevance for immediate application of its results and the advancement of knowledge it promotes. Afterwards, we explored ways

Top: **NOAA David Skaggs Research Center**

Left: **NCAR Mesa Laboratory**

to measure the impact of science (a particular project or a whole career). After group discussions that broadened our definitions of what makes science impactful, participants made plans for how to increase the impact of their personal work. The later half of the final day, led by Chain Reaction Partners, was devoted to developing the mentoring skills of the early career participants (aka future leaders), useful for different situations (writing a paper, starting collaborations, guiding a new member of a research group, etc.). This session focused on identifying the methods of being an effective mentor and practicing these methods with each other and other early career conference attendees during the main week. Both sessions (as well as the two sessions of the second day) had a large portion of group discussion and/or personal/group hands-on, which helped both to engage with the topics/skills and to meld the group.

Participants in the ECSC went on to apply the skills they obtained during the main week of the conference and in doing so helped further the collaboration and networking of all early career scientists at the IGAC 2016 conference.

Forecasting Emissions from Vegetation Fires and their Impacts on Human Health and Security in South East Asia

29 AUGUST TO 1 SEPTEMBER 2016
JAKARTA, INDONESIA

IGAC Sponsored

AUTHORS

Melita Keywood, CSIRO Climate Science Centre, Australia

Johannes Kaiser, Max Planck Institute for Chemistry, Germany

HOST INSTITUTION AND FUNDING

BMKG

FUNDING

UNISDR IWPM International Wildfire Preparedness Mechanism; kerja sama jerman DEUTSCHE ZUSAMMENARBEIT; giz; Global Wildland Fire Network; WMO; UNITED NATIONS UNIVERSITY

PARTICIPANTS

Australia, Indonesia, France, Germany, India, Indonesia, Italy, Japan, Korea, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Saudi Arabia, Singapore, Switzerland, Taiwan, Thailand, United Kingdom, United States, Vietnam

BACKGROUND

IBBI

IGAC provided financial sponsorship for this workshop to support the jointly sponsored IGAC/iLEAPS/WMO Interdisciplinary Biomass Burning Initiative which aims to foster international and interdisciplinary collaboration of research activities dealing with vegetation fires leading to improved atmospheric composition and air quality monitoring and forecasting through better scientific understanding of the various processes around biomass burning.

Participants on Day 1 of the workshop, including the Indonesian Minister of Environment and Forestry, Dr. Siti Nurbaya Bakar.

Seventy researchers representing 10 countries gathered in August/September 2017 in Jakarta, Indonesia, for the joint IBBI-WMO-IGAC-BMKG *Workshop on Forecasting Emissions from Vegetation Fires and their Impacts on Human Health and Security in South East Asia*, comprising the fourth of the series of workshops organized by IBBI. The goals of the international workshop were to:

- Provide an opportunity to share experience and knowledge between South East Asian and international scientists, representatives of national agencies and practitioners on the underlying reasons, meteorological, environmental and human health impacts of vegetation fires and smoke pollution.
- Provide initial overview of the tools for forecasting and train personnel of responsible agencies in forecasting vegetation fire smoke emissions, transport, air quality and impact on human health.
- Explore the interest and feasibility in setting up Regional Facilities that can assist WMO members in the region in forecasting vegetation fire

Jakarta, Indonesia

smoke emissions, its transport, pollution and impact and to evaluate the capacity of countries in the area in supporting/providing such facilities.

The four-day meeting was opened by the Indonesian Minister of Environment and Forestry, Dr. Siti Nurbaya Bakar. Day one included presentations from local and international experts on vegetation fires and ended in the presentation of a concept note for the establishment of a Regional Vegetation Fire and Smoke Pollution Warning and Advisory Center (RFSP-WAC).

The students practiced accessing and utilizing satellite observations of fires and smoke from space agencies and near-real time forecasts of fire risk and smoke dispersion was from routine forecasting systems like the Copernicus Atmosphere Monitoring Service.

Day two and three focused on capacity building with 30 students from 7 organizations and 8 trainers including 4 IBBI SSC members. This included exercises in analyzing data from in-situ observations on the one hand. On the other hand, the students practiced accessing and utilizing satellite observations of fires and smoke from space agencies and near-real time forecasts of fire risk and smoke dispersion was from routine forecasting systems like the Copernicus Atmosphere Monitoring Service. A highlight was the presentation by students of the results of practical exercises carried out during the training program.

The fourth day involved a reversal of roles with the students from the SE Asian region sharing their local knowledge with the trainers from around the world. It furthermore incorporated discussions of the concept note presented on the first day. The concept note sets out recommendations for A Regional Fire Smoke and Pollution Warning and Advisory Centre that would involve a program of research activities aimed at providing information needed to reduce uncertainty in the forecasting impacts of smoke from vegetation fires. The workshop demonstrated that recent scientific and operational developments like the ASEAN Specialized Meteorological Center (ASMC) in Singapore, EU's Copernicus Atmosphere Monitoring Service (CAMS) and the Global Fire Weather Database (GFWD) have matured to a stage that would allow the successful establishment of the RSPW-WAC with reasonable additional research needs:

- Adaptation of sub-seasonal to seasonal predictions of fire severity to the area
- Development of a forecasting system that relates fire danger parameters to smoke pollution parameters and models regional transport of smoke to deliver health warnings
- Development of the observational networks to provide greater spatial coverage that allow near-real time access to observational data for assimilation and verification.

17-21 JULY 2016
UNIVERSITY OF YORK, YORK, UK

IGAC Endorsed

24th International Symposium on Gas Kinetics and Related Phenomena

AUTHORS

Andrew Rickard, National Centre for Atmospheric Science, Department of Chemistry, University of York, UK

Terry Dillon, Department of Chemistry, University of York, UK

HOST INSTITUTION

FUNDING

PARTICIPANTS

Argentina, Armenia, Australia, Belgium, China, Czech Republic, Denmark, Finland, France, Germany, Hungary, India, Italy, Japan, Poland, Romania, Saudi Arabia, Spain, Switzerland, Taiwan, United Kingdom, United States

BACKGROUND

IGAC endorsed this symposium as part of its Fundamentals of Atmospheric Chemistry activity, which aims to support sustained research into fundamental physico-chemical and related processes that critically underpin descriptions and models of atmospheric chemistry.

The historic city of York, UK, the location of GK2016

The Royal Society of Chemistry's 24th International Symposium on Gas Kinetics and Related Phenomena, was held at the University of York from the 17th to the 21st July 2016. This biennial event has been a regular feature of the conference scene since its inaugural meeting in Swansea, UK in 1967. Since that time, there have been many advances in the subject of gas kinetics, and the importance of interdisciplinary science is evident in the way that the symposium has increasingly included kinetics in condensed or multi-phase systems.

Over 160 scientists from 22 countries participated in a programme consisting of over 160 presentations on themes as diverse as combustion chemistry, reaction dynamics, experimental methods, modelling of complex systems, nanoparticles and aerosols and, of course, atmospheric chemistry.

The four day conference consisted of a combination of invited plenary and contributed oral and poster presentations, providing an open forum for discussion of the latest scientific advances in various fields related to chemical kinetics and dynamics. The full programme and abstracts are

GK2016 York Participants

available at **http://www.york.ac.uk/chemistry/research/physical/gaskineticsconf2016/**.

As is now tradition, the symposium kicked off with the Sidney Benson Lecture, which was given by Professor Jürgen Troe (University of Göttingen) on *"The Simplification of Complex Chemical Kinetics: What is Essential?"*. The conference was concluded with the award of the prestigious Polanyi medal and the giving of the Polanyl Lecture. Named after Michael Polanyi – the eminent scientist, economist and philosopher, the Polanyi medal is awarded to someone who has made outstanding contributions to the field of chemical kinetics. This year's recipient was Professor James G. Anderson (Philip S. Weld Professor of Atmospheric Chemistry, Harvard University). Jim gave an enthralling lecture on the *"Kinetics of Free Radical Catalytic Photochemistry: Mapping the Molecular Scale to the Global Scale in the Context of Climate Change"*, including scientific highlights from his illustrious career, exciting current research and his thoughts for the future.

Alongside the science, delegates enjoyed a full and fun packed social programme, experiencing the delights of the historic city of York and the North Yorkshire countryside in unusually fine weather! Excursions included hiking in the Yorkshire Dales around the historic town of Masham, an afternoon at Castle Howard and a visit to York Minster. The symposium gala banquet was held at the National Railway Museum, amongst some of the world's most famous locomotives and royal carriages.

The 25th International Symposium on Gas Kinetics and Related Phenomena will be held in July 2018 in the historic city of Lille, capital of the Nord-Pas-de-Calais region in northern France, near the border with Belgium. For more information please contact the local organising committee (**Christa.Fittschen@univ-lille1.fr**) in order to be added to the conference mailing list.

If you would like to know more about and discuss the science of chemical kinetics from the fundamental dynamics of chemical reactions to the application of kinetics to the understanding of complex processes, why not join the Royal Society of Chemistry's Gas Kinetics Group, one of the RSC's special interest groups, whose Committee organise these Symposia (**http://www.rsc.org/Membership/Networking/InterestGroups/GasKinetics/index.asp**).

20 OCTOBER 2016
PORTLAND, OR, USA

IGAC Endorsed

ORGANIZERS

Nga Lee Ng, Georgia Institute of Technology, Atlanta, GA, USA

Steven Brown, NOAA, Boulder, CO, USA

HOST

American Association for Aerosol Research

FUNDING

PARTICIPANTS

China, Canada, Finland, France, Switzerland, and United States

BACKGROUND

FUNDAMENTALS ATMOSPHERIC CHEMISTRY

IGAC endorsed this special symposium as part of the IGAC activity on Fundamentals of Atmospheric Chemistry. The symposium was a follow-up event to an IGAC sponsored workshop on Nitrate Radicals and Biogenic Volatile Organic Compounds (VOCS) that took place in June 2015.

AAAR Special Symposium: Effects of NO_x and SO_2 on BVOC Oxidation and Organic Aerosol Formation

Platform presentations at the symposium.

The special symposium "Effects of NO_x and SO_2 on BVOC Oxidation and Organic Aerosol Formation" took place on October 20, 2016 at the 35th American Association for Aerosol Research (AAAR) annual conference in Portland, Oregon, USA. The organizers were Nga Lee "Sally" Ng at the Georgia Institute of Technology and Steven Brown of the NOAA Earth System Research Laboratory. The U.S. National Science Foundation (NSF) provided funding to support travel of selected participants to the symposium.

The symposium included 3 platform presentation sessions and 1 poster presentation session, with participants from 6 different countries. The symposium builds on the success of an IGAC sponsored workshop, "**Nitrate Radicals and Biogenic Volatile Organic Compounds: Oxidation, Mechanisms and Organic Aerosol**" that took place at Georgia Tech in summer 2015 and a well-attended town hall at the American Geophysical Union annual meeting in 2015.

Anthropogenic pollutants such as NO_x and SO_2 can interact with biogenic volatile organic compounds (BVOC) to impact the oxidative capacity of the atmosphere, ozone formation, and contribute to ambient fine particle loading through formation of secondary organic aerosols (SOA). The presentations at the symposium highlighted new findings

Results from field measurements in the US (SENEX, DC3, SEAC4RS), Amazonia (GoAmazon), and China demonstrated the important roles of sulfate and NOx in isoprene SOA formation.

Oregon Convention Center, Portland, USA

from laboratory, field, and modeling, and instrument development perspectives. The symposium opened with a presentation by Professor Robert Griffin from Rice University, who wrote one of the seminal papers that established the importance of nitrate radical oxidation of BVOC in SOA formation. Presentations that followed covered a range of exciting new findings. Laboratory studies reported the impacts of NO_x and SO_2 on isoprene and monoterpene oxidations, including SOA formation from nitrate radical oxidation and ozonolysis of monoterpenes under various reaction conditions, formation of highly oxidized multifunctional compounds, isoprene photooxidation and multiphase chemistry. New particle formation from BVOC in the presence of sulfuric acid, ammonia, and NO_x was also discussed. Results from field measurements in the US (SENEX, DC3, SEAC4RS), Amazonia (GoAmazon), and China demonstrated the important roles of sulfate and NO_x in isoprene SOA formation. Finally, recent modeling results on the implications of anthropogenic-biogenic interactions related to NO_x and sulfate on SOA formation were presented.

The symposium brought together senior and established scientists with graduate students, postdocs, and early career scientists working in this research area, providing career development opportunities for the junior scientists. Lively discussions after the presentations facilitated exchange of new ideas and generation of new collaborative activities in this research topic. The participation of both experimentalists and modelers in the symposium greatly enhanced efficient knowledge transfer, where laboratory/field data can provide important constraints for improved parameterization of aerosol formation in models. Such discussions will also facilitate multidisciplinary collaboration opportunities in the future.

Information about the symposium, participants, and abstracts, is available at

http://meeting2016.aaar.org/special-symposia/

http://aaarabstracts.com/2016/program_by_day.php?ViewDate=Thursday

Sara Fenech

2016 IGAC Science Conference Early Career Poster Presentation Award Session 1: Atmospheric Chemistry and Urbanization

Sara Fenech is from Malta (a 316 km^2 island in the middle of the Mediterranean) and received her undergraduate degree in Maths and Physics as well as a Master's degree in Physics from the University of Malta. For the dissertations of both degrees, she used Weather Research and Forecasting (WRF) model to carry out sensitivity studies of wind fields over the Mediterranean region. Sara is currently working on her Ph.D. in Atmospheric and Environmental Sciences within the School of GeoSciences at the University of Edinburgh. Her research focuses on the adverse effects of ozone (O_3) and particulate matter ($PM_{2.5}$) on human health.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?
From a very young age, I was always fascinated by how things work, and having very enthusiastic teachers and lecturers always inspired me to learn more. During my years at University my interest in the state of our planet and the environment around us increased greatly. It was then that I started using weather models for my research, which was both frustrating and intriguing at the same time. Following my master's degree I felt that I wanted to move from a very specific subject area to an interdisciplinary one. So my supervisor at the time suggested I apply for my current PhD.

What aspect of your research are you most excited about?
After two years of working on my project, what still excites me the most in my research is the fact that I am applying my scientific knowledge to protect something important to us all, our health.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?
In the future, I would like to continue working in research primarily on air pollution and possibly in policy making.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conferencwe
The 2016 IGAC Science Conference was my first international conference and I found it extremely helpful, inspiring and fun. It was interesting listening to people who use their research to draft new policies that have a positive impact on the air we breathe, which is something I aspire to do in the future. Meeting fellow early career students across the globe who are also working on similar topics was inspiring and made me feel part of a fantastic community. However, the high point of the conference was, meeting authors of papers I've read over and over again, in front of my poster, which proved to be both nerve-racking and motivating at the same time.

2016 IGAC Science Conference Early Career Poster Presentation Award Sara Fenech

1.058 Quantifying uncertainties in multi-pollutants health impacts in urban/rural regions across the UK.

Early Career Scientist

Presenting Author:
Sara Fenech, School of GeoSciences, University of Edinburgh, s1473248@sms.ed.ac.uk

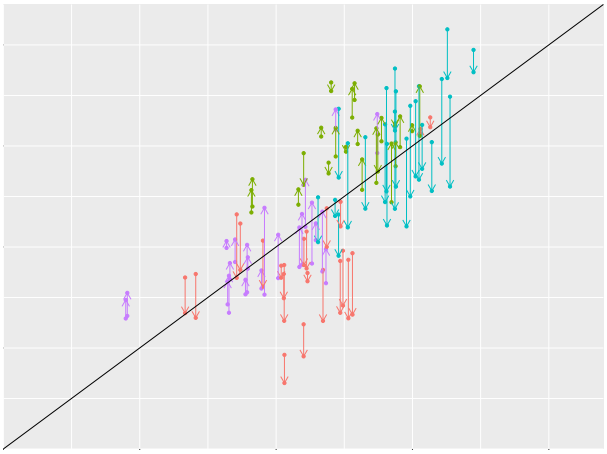
Co-Authors:
Ruth Doherty, School of GeoSciences, University of Edinburgh
Clare Heaviside, Air Pollution and Climate Change Group Public Health England
Sotiris Vardoulakis, Air Pollution and Climate Change Group Public Health England
Fiona O'Connor, Met Office

Abstract:

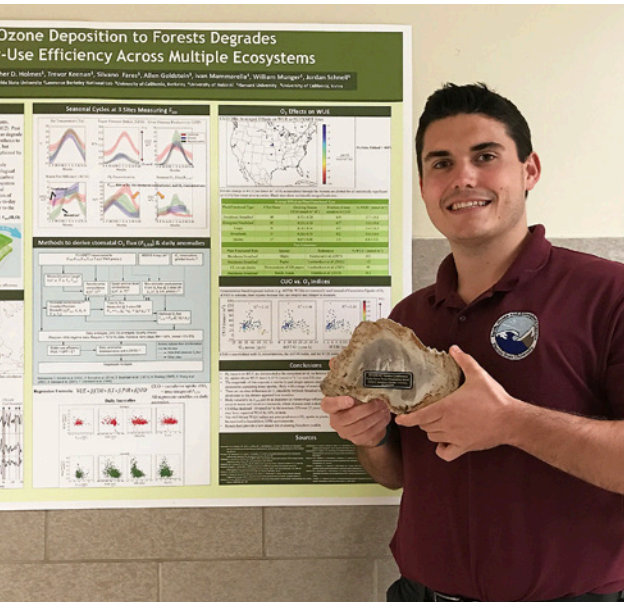
The adverse impacts of air pollution on human health due to exposure to ozone (O_3), and $PM_{2.5}$ are well established. However, there are numerous uncertainties in quantifying region-wide health impacts e.g. due to uncertainties in simulating urban air pollutant concentrations and for coefficients that determine exposure-response relationships. Previous studies using chemical transport model simulations outline the importance of model resolution for simulating O_3 concentrations to be used in health impacts studies. However there are very few studies that discuss the effects of uncertainty in model resolution for determining PM-related health impacts. In this study we have used the UK chemistry and aerosol (UKCA) model to quantify the impact of model resolution and uncertainty in concentration-response coefficients on simulated pollutant concentrations and associated health impacts.

Two model configurations were used: a global resolution (~ 150 km) and a regional resolution (~ 50 km) over Europe. Our regional configuration shows similar results to previous studies for O_3 concentrations, in particular better agreement with measurements for the diurnal cycle for O_3 compared to global model results. In addition, the regional simulation better captures the lower O_3 levels associated with high NO_x levels in large cities (due to higher emission resolution). In contrast, differences in model performance for $PM_{2.5}$ for the two resolutions are not as evident. However the regional configuration gives a better representation of hotspots whereas the global configuration underestimates high $PM_{2.5}$ levels. These results are being linked to population and baseline mortality data to predict uncertainty ranges for $PM_{2.5}$ health impacts over Europe due to long-term exposure.

UKCA simulations at the local scale (~ 12 km) will also be utilised to assess health impacts due to $PM_{2.5}$ episodes across the UK. Future work will consider how health burdens will change in urban areas due to higher population density and climate change.



Seasonal mean comparison of modelled to observed O_3 for 22 sites across the EMEP network for the year 2007. The arrow tails mark the O_3 values obtained from simulations using a global horizontal resolution (150 km by 150 km) while the arrow heads represent the corresponding O_3 values obtained from simulations using a regional horizontal resolution (50 km by 50 km). The regional configuration is driven by boundary and initial conditions from the global configuration.



Jason Ducker

2016 IGAC Science Conference Early Career Poster Presentation Award Session 2: Atmospheric chemistry, ecosystems, and agriculture

Jason Ducker is from Coral Springs, FL, USA. He received a bachelor's and master's degree in Meteorology from Florida State University in Tallahassee, FL. Currently, Jason is a research assistant with Dr. Christopher D. Holmes in his group at Florida State University. Jason's current research focuses on analyzing ozone effects on ecosystem water-use efficiency (WUE), which is the ratio of carbon uptake in photosynthesis to water loss through transpiration, across flux tower sites in the US. Since few sites measure the ozone flux, we have derived an algorithm to calculate ozone fluxes and expand our analysis, between the cumulative uptake of ozone (CUO) and WUE, to different ecosystems in the US and Europe. Currently, we are in the process of publishing our results. We intend to improve the non-stomatal schemes in our ozone deposition algorithm and expand the analysis to flux tower sites in Europe and the tropics. Our results will be used to validate and improve climate model simulations of ecosystem health and the global carbon and water cycles.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?

In 2005, I experienced the devastation of hurricane Wilma in my hometown of Coral Springs. After witnessing the destructive impacts by the hurricane, I wanted to discover more about the atmosphere's influence on the global scale. I pursued my bachelor's degree in Meteorology at Florida State University and decided that I wanted to continue on in graduate school. Before attending graduate school, I visited my grandfather's farm in Morganfield, KY, US. He told me that the climate extremes have been severely affecting his crop yields for the past decade. I was fascinated by the coupled feedbacks between crops and the atmosphere, but I did not know very much about the topic. Then, I met Dr. Christopher D. Holmes at the start of graduate school. Chris illustrated the profound impacts that atmospheric chemistry has on biosphere-atmosphere interactions, especially with crop yields. From there on, I wanted to incorporate my Meteorological skills to boundary layer processes between the atmosphere and ecosystems and understand climate impacts on ecosystem health.

What aspect of your research are you most excited about?

Ozone degrades ecosystem water-use efficiency (WUE), which perturbs the global carbon and water cycle. Our data sets would serve to improve biosphere model simulations, especially in polluted regions. Also, my research could decipher impacts between atmospheric drivers and air quality on WUE for forests and croplands. Using this knowledge, we can consult farmers and paper mill corporations about areas susceptible to significant losses in biomass yield due to air quality and climate extremes.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?

I would like to gain more experience with NCAR's Earth system models in the future. Understanding the feedbacks between components in an Earth system is a critical aspect in interpreting the uncertainty of model simulations. With more modeling experience, I want to consult farmers and agricultural corporations about the vulnerability of biomass yield losses and provide long-term solutions.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conference?

I was surprised to learn about multiple a flux tower site measuring ozone concentrations in the Amazon forest from Ana Maria Yañez Serrano's talk. There has been very few studies about ozone effects on tropical ecosystems, so we are hoping to obtain the flux tower data in the Amazon forest. Also, Allen Goldstein provided some great feedback on other statistical methods for deciphering signals between stomatal ozone uptake and plant physiology. We are looking to closely collaborate with Dr. Goldstein for future work in this area of interest.

2016 IGAC Science Conference Early Career Poster Presentation Award Jason Ducker

2.034 Ozone deposition degrades water-use efficiency across multiple ecosystems.

Early Career Scientist

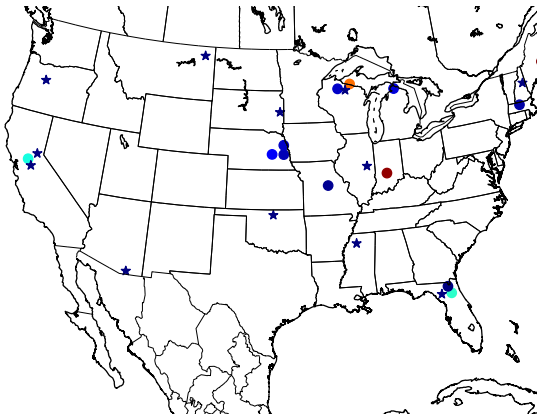
Presenting Author:
Jason Ducker, Florida State University, jad10d@my.fsu.edu

Co-Authors:
Christopher Holmes, Florida State University

Abstract:

Surface ozone (O_3) is an air pollutant and greenhouse gas that is toxic to plants, reducing their growth and ability to regulate water loss. Past controlled, single-species experiments have shown that current atmospheric O_3 levels degrade water-use efficiency (WUE), which is the ratio of carbon uptake in photosynthesis to water loss in transpiration, in several crop and tree species. This implies that O_3 air pollution modifies the terrestrial water cycle and precipitation, but no prior studies have documented the O_3 impact on WUE at the ecosystem level.

We correlate WUE with stomatal O_3 uptake and meteorological factors at 23 eddy-covariance flux towers in the US and Europe that span a wide range of temperate forest and crop ecosystems. After removing the mean seasonal cycle of all variables, we find that daily anomalies in stomatal O_3 uptake degrade WUE by 1-3% at most sites ($p < 0.05$), in addition to the expected dependencies on temperature, humidity, and photosynthetically active radiation (PAR). This O_3 impact on WUE is similar to that found in controlled, single-species experiments and of the same magnitude as the response to daily variations in temperature, humidity and PAR. Affected ecosystems include broadleaf crops and all forest types, indicating that O_3 impacts are widespread among many species that have not been studied individually and that the aggregated effects across an ecosystem are similar to those of individual species. The largest impacts on WUE occur in ecosystems with high stomatal conductance, such as broadleaf forests, humid climates, or irrigated crops, rather than where surface O_3 concentrations are highest. The weakest O_3 impacts occur in ecosystems with large populations of C4 plants, but longer data records are needed to confirm this at the ecosystem level. Ongoing work is exploring how well land biosphere models can simulate these effects of O_3.



Percent change in WUE per mmol m-2 of O_3 accumulated through the stomata is plotted for all statistically significant ($p<0.05$) flux tower sites in circles. Black stars show statistically insignificant sites. Hyytiala forest in Finland revealed a -2.1% change in WUE per mmol m-2 of O_3 accumulated.

Ingrid Mielke-Maday

Early Career Scientist Profile:2016 IGAC Science Conference
Early Career Poster Presentation Award
Session 3: Atmospheric chemistry and energy

Ingrid Mielke-Maday is from Chicago, IL, USA. She received a Bachelor of Science in Chemistry with a minor in French and Francophone studies from the College of William and Mary in Williamsburg, VA, USA in 2012. Currently, Ingrid is a doctoral student in the Department of Chemistry and Biochemistry at the University of Colorado and is a research assistant at the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) Global Monitoring Division (GMD), both in Boulder, CO, USA. Her current research focuses on attributing regional methane emissions in oil and natural gas basins to oil and natural gas sources and other sources using measured ethane-to-methane signatures from methane plumes.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?
Growing up, my parents helped foster curiosity about the world and a love of science without me even realizing it by asking my siblings and me questions to prompt us to think about how the world around us worked. In particular, my mother, who is a scientist, has served as a great role model of what women can accomplish in scientific research. Additionally, her support over the years prevented me from believing the stereotype of science being intimidating, a barrier to pursuing a career in science that I feel that others without a role model can find difficult to overcome. It was not until halfway through college that I learned about atmospheric chemistry from a program run by Gannet Hallar at Storm Peak Laboratory. I was drawn to atmospheric chemistry because of its incorporation of many interesting topics and its applicability to important environmental problems.

What aspect of your research are you most excited about?
What excites me most about my research is the potential for results to inform policy decisions that can reduce greenhouse gas emissions and human impact on the earth. The information we will provide as a result of this research will be of interest to multiple groups, including oil and natural gas operators, policymakers, and communities. It is exciting and enjoyable to engage with all different kinds of people and groups who are interested in my research.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?
I would like to pursue a career as an environmental engineer in the field of air quality working on problems related to environmental and public health. I am interested in implementing technologies in a variety of settings to capture gaseous and particulate pollutants to prevent their emission into the atmosphere.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conference?
I really enjoyed the presentation at IGAC by guest speaker Marcelo Meno Carrasco, who spoke about the reduction of particulate matter concentrations in Chile. It was interesting and inspiring to see how research informed policy decisions that resulted in dramatic improvements in air quality that will positively affect the lives of many residents. Throughout the IGAC conference, I liked being able to get to know scientists from all over the world in a more personal setting than would have been possible to have had at other conferences.

2016 IGAC Science Conference Early Career Poster Presentation Award Ingrid Mielke-Maday

3.018 Methane attribution in a U.S. onshore dry gas basin using ground and airborne measured C2H6/CH4 enhancement ratios.

Early Career Scientist

Presenting Author:

Ingrid Mielke-Maday, University of Colorado Boulder/NOAA/CIRES, Boulder, Colorado, USA, **ingrid.mielke-maday@noaa.gov**

Co-Authors:

Stefan Schwietzke, NOAA/CIRES
Eryka Thorley, CIRES
Tara Yacoyitch, Aerodyne Research, Inc.
Steve Conley, University of California-Davis
Jonathan Kofler, NOAA/CIRES
Philip Handley, NOAA
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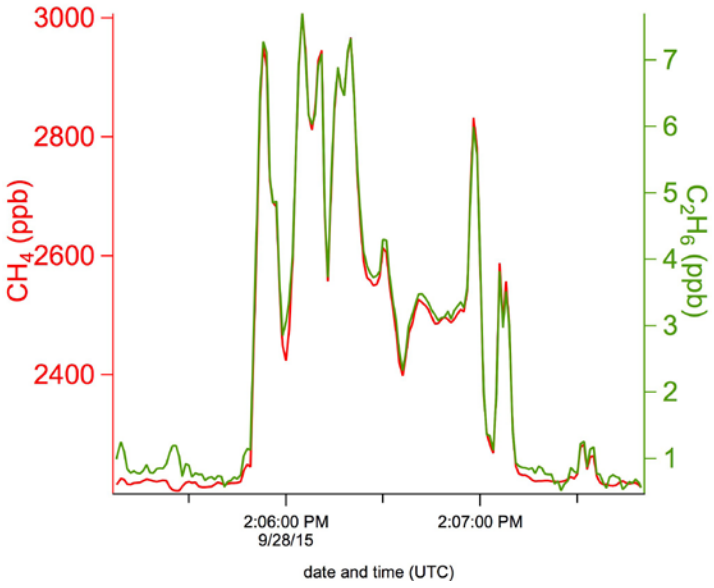
Brad Hall, NOAA
Ed Dlugokencky, NOAA
Pat Lang, NOAA
Sonja Wolter, NOAA/CIRES
Eric Moglia, NOAA/CIRES
Molly Crotwell, NOAA/CIRES
Russ Schnell, NOAA
Gabrielle Pétron, NOAA/CIRES

Abstract:

Here we present results that will be used to perform a methane (CH_4) source attribution in a dry gas-producing basin in the United States in order to estimate the contribution from natural gas operations to the total methane in that basin. Methane enhancements were documented and ethane to methane enhancement signatures (C_2H_6/CH_4) were compiled in CH_4 plumes in a portion of the Fayetteville Shale in northern Arkansas using a quantum cascade tunable infrared laser direct absorption spectrometer (QC- TILDAS) (Aerodyne Research, Inc.) aboard a mobile laboratory. The C_2H_6/CH_4 enhancement ratio (ER) can be used to differentiate between fossil fuel and microbial CH_4 sources because C_2H6 is not co-emitted with CH_4 from microbial sources. C_2H_6/CH_4 ERs from natural gas sources obtained with in situ measurements show good agreement with ratios calculated using discrete flask samples collected in the same facility plumes. Repeatability in the C_2H_6/CH_4 ER at several natural gas facilities across multiple days suggests that an ER measured at a facility on any given day is representative of routine emissions. C_2H_6/CH_4 ERs from natural gas facilities display spatial variability throughout the study area, with the eastern region containing a relatively high number of facilities with large C_2H_6/CH_4 ERs, which underscores the need to take spatial variability in natural gas composition into account when performing a methane attribution.



Example of natural gas plume in situ measurements from Aerodyne $C_2H_6/CH_4/H_2O$ analyzer aboard mobile laboratory.

Rebecca Simpson

2016 IGAC Science Conference
Early Career Poster Presentation Award
Session 4: Atmospheric chemistry and fundamental studies

Rebecca Simpson is from Centennial, CO, USA. She received her undergraduate degree in Environmental Science and Chemistry from Colorado College in Colorado Springs, CO, USA. Rebecca then went on to earn a Master of Science and a Ph.D. at the University of Hawai'i at Manoa, HI, USA in Chemical Oceanography and Atmospheric Chemistry. Currently, Rebecca works for the Colorado Department of Public Health and Environment as an Emissions Inventory Specialist and Modeler focusing on the Denver, CO, USA Metro/ Northern Front Range ozone nonattainment area and greenhouse gas emissions from oil and gas operations.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?

My great professors at Colorado College encouraged my enthusiasm for science, which I wasn't planning on majoring in until I found that I enjoyed my science classes much more than other subjects. The small classes, high level of hands-on learning, amazing field trips, and interdisciplinary nature of our curriculum really appealed to me. It was an easy decision to move to Hawai'i to study marine atmospheric chemistry (and surfing) in the beautiful Pacific. I got to learn about ocean science while studying the natural sources of gases and particles to the marine atmosphere.

What aspect of your research are you most excited about?

I'm fascinated by our constantly evolving ideas and measurement techniques for quantifying oceanic sources of material to the marine boundary layer. We still have much to understand about ocean-atmosphere interactions as well as the gas-particle-cloud interactions that a) profoundly shape the aerosol size distribution (and thus CCN) in remote regions and b) vary with oceanic regime.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?

Thus far, I'm excited about my new job working for a state air quality department that interacts with other state and federal planning organizations. I hope to facilitate increased collaboration with the wealth of excellent researchers in Colorado to advance our effectiveness at solving problems and serving the public.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conference?

The most interesting thing that I learned was how many researchers are specifically studying emissions from oil and natural gas operations. Though I met many great people, the most interesting person I met was my randomly assigned roommate (and new friend), Saumya Singh. I'll never forget our revelatory discussions about life in her native India versus the U.S.

2016 IGAC Science Conference Early Career Poster Presentation Award Rebecca Simpson

4.084 Revising concepts of methanesulfonic acid (MSA) formation in the remote tropical Pacific marine boundary layer using high-resolution measurements and a thermodynamic model of aerosol chemistry.

Early Career Scientist

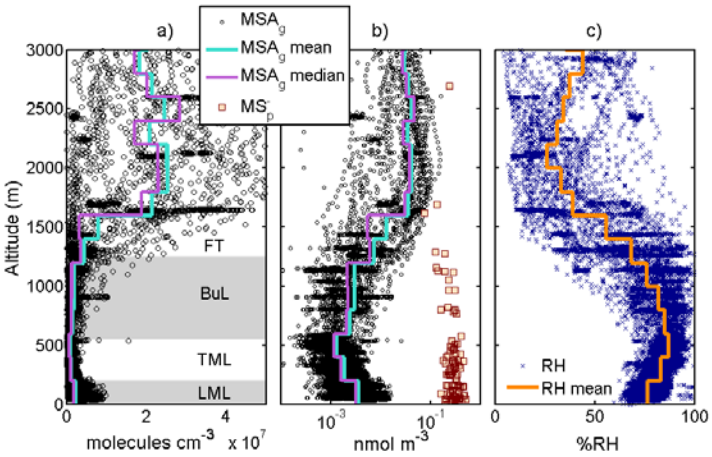
Presenting Author:
Rebecca Simpson, University of Hawaii at Manoa,
rebeccamcsimpson@gmail.com

Co-Authors:
Steven Howell, University of Hawaii at Manoa
Barry Huebert, University of Hawaii at Manoa

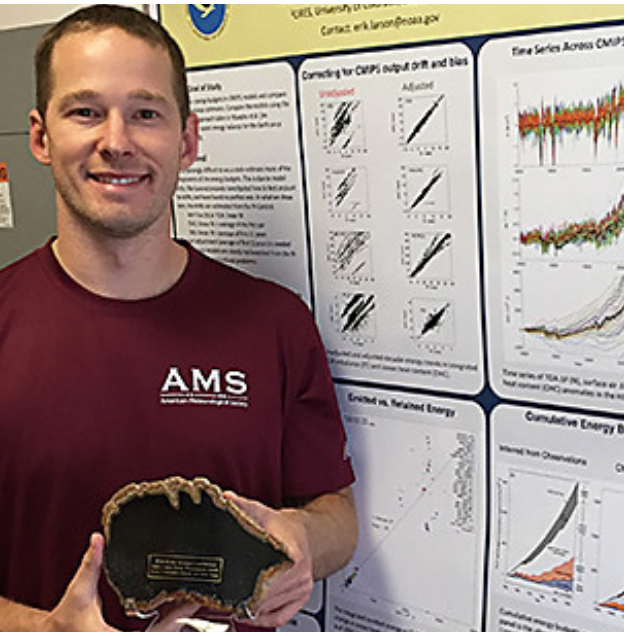
Abstract:

We report and interpret high-resolution methanesulfonic acid (MSA) and methanesulfonate (MS^-) measurements collected during a field campaign in the tropical Pacific marine boundary layer (MBL). An earlier study noted vapor-phase MSA was twice as concentrated near the ocean surface as at the top of the mixed layer. We use aerosol composition mea-surements and the online Extended AIM Aerosol Thermodynamics Model (E-AIM; *Clegget al.* [1998]) to demonstrate that this pattern is due to evaporation of particulate MSA from sulfuric acid-dominated particles. We cannot rule out the possibility of a small homogeneous production source.

Up to 99% of the MS^- in aerosol forms in the aqueous phase after DMSO/MSIA vapor is wet-scavenged and oxidized to MS^- in aerosol water and cloud droplets. More alkaline coarse-mode aerosol generates MS^- by this mechanism and gathers MSA evading from fine particles. It is not clear which of these paths is more important. The lower FT is a source of MSA to the buffer layer (BuL) (entrainment flux: 9.9 × 10^{11}molecules/cm^2/d), probably dissolving in cloud droplets and emerging below cloud as find-mode MS^-. Most fine-mode MS^-, however, is formed in cloud from DMSO/MSIA, while coarse-mode MS^- is formed on sea salt particles that have greater alkalinity.



PASE MSA gas profile (CIMS 10s data from L. Mauldin and R. Hornbrook) with 200m-bin mean and median traces. In b), total particulate methane sulfonate (MOUDI (30min data) is plotted with MSA on a logarithmic x-scale. Typically expressed in units of molecules/cm3, MSA concentrations in b) are in nmol/m3 to compare with particulate concentrations. The % Relative Humidity (RH) profile appears in c).



Erik Larson

2016 IGAC Science Conference Early Career Poster Presentation Award Session 5: Atmospheric chemistry and climate

Erik Larson grew up on a farm in Iowa, USA. He received a Bachelor of Arts in Physics and Biology from Grinnell College in Grinnell, IA, USA. Erik then attended the University of Colorado, Boulder, CO, USA where he received a Master of Science in Astrophysical and Planetary Science and then a Ph.D. in Atmospheric and Oceanic Science. Currently, Erik is a research scientist at the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado (CU) and at the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) Chemical Science Division, both located in Boulder, CO, USA. His current research uses earth system models to better understand fundamental questions about Earth's atmosphere. Specifically, he uses these models to calculate radiative forcing and make estimates of Earth's energy budget and he also investigates the impacts of current and future rocket emissions on the climate.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?

I have been fascinated by science as far back as I can remember. I remember reading books about everything from dinosaurs to planets and always wanting to know more. I have an uncle, Larry Hall, who is a pharmacist. He encouraged my interest in science at a young age by indulging all my questions about science. We would have lengthy discussions while pulling weeds in the bean fields. I just sort of fell into atmospheric chemistry. I kept pursuing a broad area of coursework and research in college and graduate school. I jumped at the chance to stay in Boulder and work for NOAA, which led me to climate and chemistry focused research. I was worried about my lack of chemistry background when joining CSD, but was reassured that most people here have backgrounds in physics, dynamics, radiative transfer and meteorology.

What aspect of your research are you most excited about?

I really enjoy the big picture scale of this current project. It is fun to think about the Earth's energy and temperature change on global scales. I also get satisfaction that this work is actually relevant to society and policymakers. This is very different satisfaction than I had studying Titan's atmosphere in graduate school.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?

I would like a faculty position somewhere that allows me to continue the collaborations I have made at NOAA and CU while also pursuing my eclectic research interests.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conference?

I really liked how Oliver Wild was characterizing model uncertainty. The parameter space to explore for sensitivity studies is dauntingly large and he came up with a novel way of identifying important parameters. I also enjoyed Marcelo Carrasco's talk. It was inspiring and refreshing to see a trained scientist in an important political position. That seems to be incredibly rare in American politics, much to the detriment of America.

See the **NOAA website** for more information on Erik's award.

2016 IGAC Science Conference Early Career Poster Presentation Award Erik Larson

5.041 CMIP5 estimate of Earth's energy budget.

Early Career Scientist

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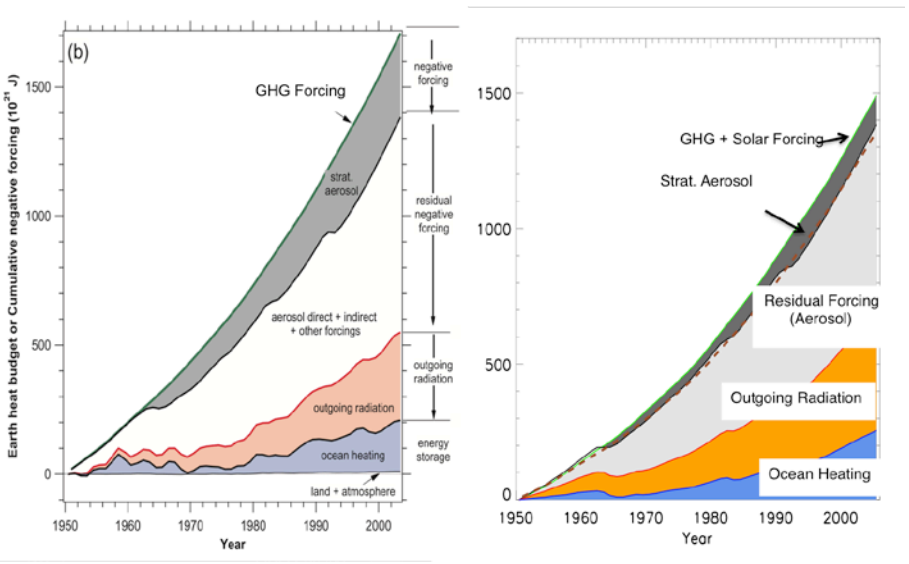
Abstract:

The inability to make direct measurements and the complexity of the processes involved make it difficult to quantify all the components of the Earth's energy budget. Climate models have the potential to greatly inform our understanding of the relevant processes controlling the energy budget. There have been a series of climate model intercomparison projects (CMIP), the latest version of these projects, CMIP5, has contributions from dozens of global climate models. We use these models to understand how much energy has come into the Earth system since preindustrial times and the fate of that energy, whether it has warmed the oceans or been radiated back to space. Climate models have errors, biases and drifts that must be accurately accounted for to estimate anthropogenic climate change. Much of the drift can be accounted for by using anomalies from preindustrial control simulations. Despite these adjustments, there is substantial variation between the various CMIP5 models of fundamental quantities such as ocean heat content and top of the atmosphere radiative imbalance. However, much of this variation is around a mean that is consistent with observations. One quantity of interest is the ratio of energy radiated back to space to that absorbed by the ocean. Since 1957, the CMIP5 models estimate that roughly 63% of the integrated forcing is radiated back to space with 37% being stored in the ocean. The models further estimate that 15% of the change in the ocean heat content is stored in the deep ocean below 2000 m. With proper adjustments and corrections, the CMIP5 suite of climate models can robustly predict the historical trends and magnitudes of climate change. The success of these models to predict historical changes lends credence to their predictions of an ever changing future Earth.



The components of Earth's cumulative energy budget over 1950-2006. The left panel is the observational estimates from Murphy et al. [2009] Fig 6b and the right panel is from the CMIP5 multi-model mean. Fifteen CMIP5 models had all the simulations needed to be included in this plot.

Jorge Luis Baylon Cardiel

2016 IGAC Science Conference Early Career Poster Presentation Award Session 6: Atmospheric chemistry – observing composition and variability

Jorge Baylon is from Juarez, a city in northern Mexico. He received a Bachelor of Science in Engineering Physics from Tecnológico de Monterrey in Monterrey, Mexico and a Master of Science in Physics from Universidad Nacional Autónoma de México (UNAM) in Mexico City, Mexico. Currently, Jorge is a third-year Ph.D. student in the Earth Science graduate program at UNAM. His research focuses on using remote sensing to study the composition of the atmosphere in and around the Mexico City Metropolitan area.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?

I chose a career in science because I have always thought that making a living out of figuring out how stuff works must be a really fun and satisfying career path.

What aspect of your research are you most excited about?

I previously worked on investigating cosmic rays in the field of experimental particle physics. I enjoyed working in this field but struggled to tell people not familiar to the subject the significance of this area. I knew I wanted my next project to be rich with scientific challenges but also relevant to society. I think that atmospheric chemistry was the right choice since the outcomes of our research can help take better decisions in benefit of our health or our economy. I enjoy the process of discovery and sharing my results with a wider audience, especially when doing so involves traveling and meeting new people around the world.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?

I hope to continue working on measuring the composition of the atmosphere and switch to projects involving satellite missions.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conference?

It was interesting to hear from the keynote by Allen Goldstein on the future of atmospheric chemistry research and how we must improve our knowledge of the atmospheric chemistry of indoor environments and the interplay between indoor and outdoor air quality. I was very pleased to meet and hear a talk from Clare Murphy (Paton-Walsh) because one of the first papers I read about remote sensing of the atmosphere was from her.

2016 IGAC Science Conference Early Career Poster Presentation Award Jorge Luis Baylon Cardiel

6.135 CO2 variability and trends in Mexico.

Early Career Scientist

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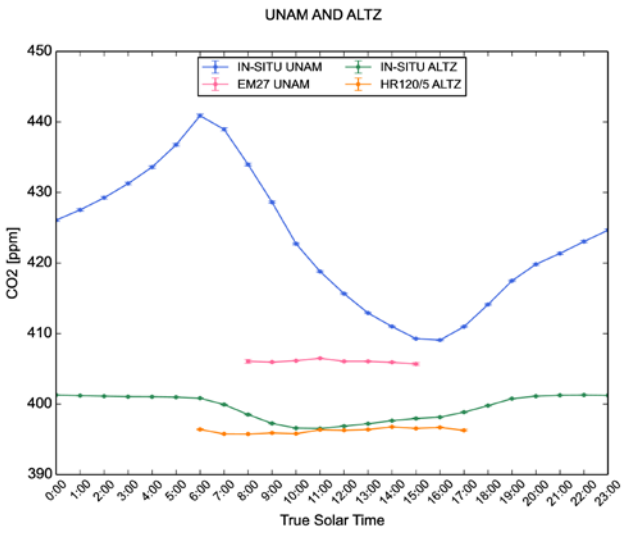
Abstract:

Carbon dioxide has been rising since the Industrial Era to levels over 400 ppm in the last years. CO2 is the most important greenhouse gas from anthropogenic sources, it has a long atmospheric lifetime which makes for its high background atmospheric concentration that shows relatively small spatial and temporal variations. To account for this variability, dense and continuous CO2 observations are needed. Since 2014, CO2 has been monitored in six stations from the University Network of Atmospheric Observatories RUOA (www.ruoa.unam.mx) using commercial cavity ring-down spectrometers. Three of these stations are within protected natural areas and are considered remote sites, whereas the rest are located within urban areas. At two of these sites, Altzomoni (N19.18°, W 98.65, 3985 masl) and the UNAM campus in Mexico City (N 19.32°, W 99.17°W, 2260 masl), the total vertical column of this gas is determined from solar absorption infrared measurements made in the near-infrared (NIR) spectral region and compared to satellite observations. In this work we present and interpret the data collected at these stations and show the seasonal variability and trends of CO2 in very distinct regions of the Mexican territory.



Diurnal cycles of two sites located in and outside of Mexico City, one an urban site in the south of the city (UNAM Campus, UNAM) and the other a remote site 50km from the city (Altzomoni site, ALTZ). The cycles were estimated using in-situ measurements from PICARRO G2401 analyzers (blue and green lines) and dry-air column-average mole fractions of CO_2 from measurements of two solar absorption IR spectrometers, a high resolution in ALTZ (Bruker HR120/5, orange line) and a low resolution in UNAM (Bruker EM27, pink line). The concentrations and cycle from the urban site is dominated by anthropogenic emissions while the remote site is more influenced by the biological processes of the surroundings.

Catherine Scott

2016 IGAC Science Conference Early Career Oral Presentation Award

Cat Scott is from the United Kingdom. She received her undergraduate degree in Chemistry from the University of Manchester, Manchester, UK. Cat then went on to earn a Master's in Environmental Engineering and a Ph.D. in Atmospheric Science from the University of Leeds, UK. Currently, Cat is a Postdoctoral Research Fellow & Coordinator of the Leeds Ecosystem, Atmosphere and Forest (LEAF) Centre, University of Leeds, UK and is researching the way that the biosphere and atmosphere interact through the emission of gases from vegetation and the subsequent chemistry and aerosol processes.

What and/or who motivated you to pursue a career in science and more specifically in atmospheric chemistry?

Towards the end of my undergraduate degree, we started to learn about how the chemistry we'd been studying for the past few years was actually taking place in the atmosphere around us. We learned about the way human pollution was affecting the composition of the atmosphere and pushing the Earth system away from radiative equilibrium. I realised at that point that this was what I wanted to research; understanding the drivers of climate change and what we are able to do about it.

What aspect of your research are you most excited about?

I am just about to start a new project looking at the way that natural aerosol processes are represented in Earth System Models. I think the development of these models provides a really exciting opportunity for us to look at some of the effects we've been studying in simpler models in a more joined up way. This means that the processes we study in the atmosphere can interact directly with the land surface, larger scale climate, and the hydrological cycle.

As an early career scientist, you have an exciting future ahead of you. What type of career and topic do you hope to be working on in 5 or 10 years from now?

Ultimately I'd like to improve our understanding of the way that choices and policies around land-use change might help us to meet the ambitious targets set out in the Paris Climate Agreement – what should we be doing over the next couple of decades to ensure that these targets are feasible? I am also interested in looking at the way the biosphere and humans interact at a much smaller scale, for example the way that green spaces in urban areas are able to influence air quality and local climate.

What was the most interesting thing you learned and who was the most interesting person you met during the 2016 IGAC Science Conference?

This is difficult as there was so much to choose from! There were many presentations and posters on the emission and behaviour of biogenic volatile organic compounds (BVOCs), which was very interesting for me! As a modeller it's always useful to hear more about laboratory based studies (such as Joel Thornton's presentation on chamber measurements of SOA formation), and atmospheric measurement campaigns (such as Ana Maria Yañez-Serrano's presentation on results from the ATTO tower). I met Lisa Kaser from NCAR who is doing some really interesting work examining the impacts of forest burning on BVOC emissions at the Manitou Experimental Forest Observatory in Colorado, USA.

2016 IGAC Science Conference Early Career Oral Presentation Award Catherine Scott

2.069 Including the biogeochemical impacts of deforestation increases projected warming of climate.

Early Career Scientist

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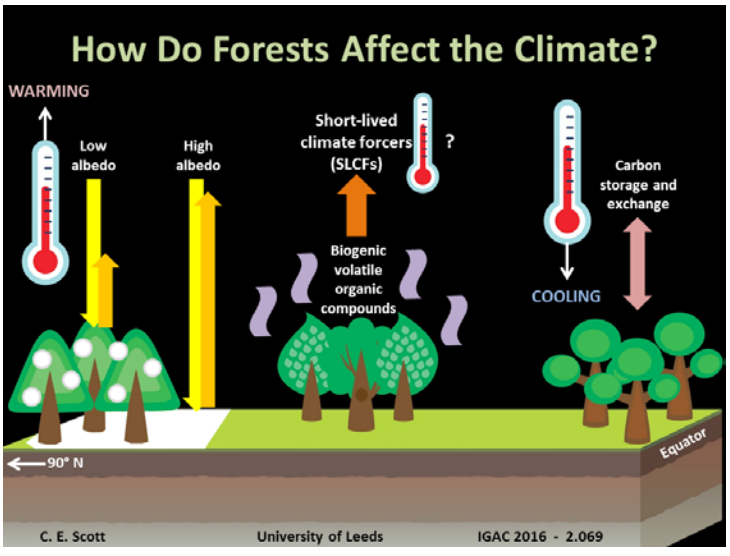
Abstract:

Forests cover almost one third of the Earth's land area and their distribution is changing as a result of human activities. The presence, and removal, of forests affects the climate in many ways, with the net climate impact of deforestation dependent upon the relative strength of these effects (Betts, 2000; Bala *et al.*, 2007; Davin and de Noblet-Ducoudré, 2010).

In addition to affecting surface albedo and exchanging carbon dioxide (CO_2) and moisture with the atmosphere, vegetation emits biogenic volatile organic compounds (BVOCs), altering the formation of short lived climate forcers (SLCF) including aerosol, ozone and methane.



In this work we quantify the way that deforestation changes the concentration of short-lived climate forcers (such as ozone, methane and secondary organic aerosol) in the atmosphere, and how this affects the climate.

AUTHORS

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Frank Dentener, Co-Chair TF HTAP; European Commission, JRC, Italy

BACKGROUND

LRTAP Task Force on Hemispheric Transport of Air Pollution

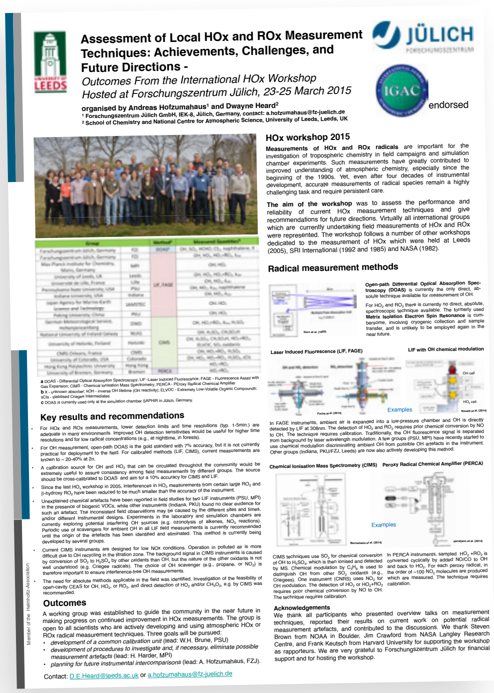
IGAC strives to collaborate with other international organizations to help facilitate atmospheric chemistry research. The Task Force on Hemispheric Transport and Air Pollution (TF HTAP) is one such international organization that IGAC collaborates with.

From Modeling and Analysis to Policy Relevant Messages: Report on the HTAP Session at IGAC 2016 and Next Steps

Over the last 10 years the Task Force on Hemispheric Transport of Air Pollution (TF HTAP) under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution has worked with an international scientific network of experts from Europe, North America, and Asia to improve the understanding of the intercontinental transport of air pollution across the Northern Hemisphere. At IGAC 2016, TF HTAP contributors met to discuss the status of their current analyses and plans for the coming year. The major focus of the TF HTAP in the coming year will be to wrap up analyses of the current HTAP2 experiments and identify policy relevant messages that can be communicated to the LRTAP Convention and other audiences. Based on that meeting and follow-up activities, there are several important updates:

- The submission deadline for the ACP Special Issue "Global and regional assessment of intercontinental transport of air pollution: results from HTAP, AQMEII and MICS" has been extended to 1 June 2017, although participants are encouraged to submit contributions by 1 March 2017 or share a draft through the HTAP wiki so that key findings can be considered.
- Two documents are now available that provide documentation of the rationale and assumptions in the HTAP2, AQMEII3, and MICS3 experiments. Participants are invited to provide comments and authors writing for the special issue are encouraged to reference these documents:
  - A technical note under discussion in ACPD (**http://www.atmos-chem-phys-discuss.net/acp-2016-828/**) intended to provide an overview of the joint studies
  - A JRC report, HTAP_Hemispheric Transport of Air Pollution (HTAP): Specification of the HTAP2 experiments, intended to document the details in the simulation set up.
- The next TF HTAP meeting will take place 3-4 April 2017 in Research Triangle Park, North Carolina, where the focus will be on discussing policy relevant findings of the HTAP2 analyses. This meeting will directly precede a kickoff meeting on 5-6 April for a new set of grants that have been awarded by the USEPA for research on "Particulate Matter and Related Pollutants in a Changing World." Registration and logistical information will be posted on **www.htap.org** and distributed through the TF HTAP e-mail list.

Participation in TF HTAP meetings and analyses is open to all interested experts and IGAC participants are encouraged to take advantage of the open archive of HTAP2 modeling experiments for analysis and comparison. For more information, see **http://iek8wikis.iek.fz-juelich.de/HTAPWiki/Theme2**.



NOW AVAILABLE:

Report from the Workshop 'Assessment of local HO_X and RO_X Measurement Techniques: Achievements, Challenges, and Future Directions'

AS REPORTED IN IGAC NEWSLETTER ISSUE NO. 55, an international IGAC-endorsed workshop took place in March 2015 at Forschungszentrum Jülich, Germany, to assess the performance and reliability of current atmospheric HO_X measurement techniques. The techniques under discussion are based on laser absorption and laser-induced fluorescence spectroscopy, chemical ionisation mass spectrometry, and chemical techniques. The workshop report has now become available as an electronic document. It gives an overview about current HO_X and RO_X measurement instruments and shows the diversity of technical realisations of different methods. It provides a summary of the workshop presentations and discussions about detection sensitivities, calibration, and possible measurement artefacts of different techniques. Recommendations are given for further instrumental improvements and new developments. The document also contains session reports from neutral rapporteurs and a collection of short descriptions of instruments provided by the workshop participants.

The workshop report is available at:

http://www.fz-juelich.de/iek/iek-8/EN/AboutUs/Projects/HOxROxWorkingGroup/HOxWorkshop2015_node.html

As one of the outcomes of the workshop, an international working group was established to guide the community in the near future in making progress on continued improvement in HO_X measurements. The working group is open to the community, and interested measurement groups are invited to take part. For further details, see

http://www.fz-juelich.de/iek/iek-8/EN/AboutUs/Projects/HOxROxWorkingGroup/HOxROxWorkingGroup_node.html

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