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IGACnews

facilitating atmospheric chemistry research towards a sustainable world

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14th Quadrennial Symposium iCACGP 15th Science Conference IGAC 2018 TAKAMATSU KAGAWA JAPAN

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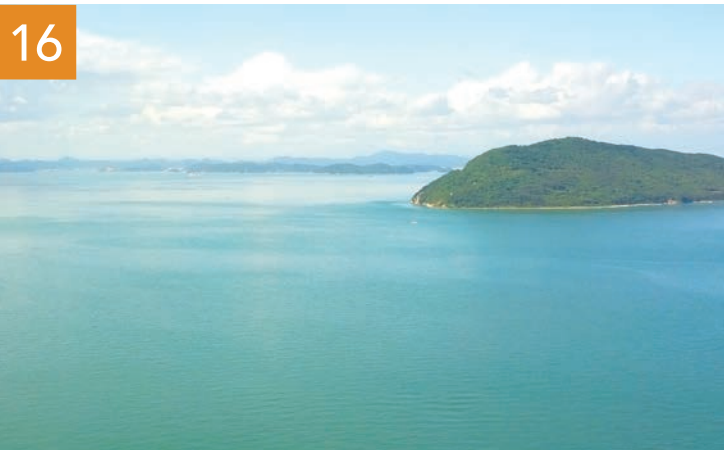

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On the Cover

Participants of the 2018 joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference.

COURTESY: MAKOTO INOUE/SACHIKO OKAMOTO

Editor: Megan L. Melamed
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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.

What Makes IGAC Successful? YOU!

Every two years, I am reminded of what an incredible community IGAC is during our biennial science conference. This year was no exception. We had a record number of participants at the 2018 joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference. IGAC continues to grow its community and facilitate atmospheric chemistry research toward a sustainable world.

Here's a little secret though, there is only one person who is paid to work for IGAC, me. The magic that really happens to make IGAC so successful is the hundreds of volunteers who believe so strongly in IGAC's mission that they are willing to devote unpaid time to make IGAC a thriving organization.

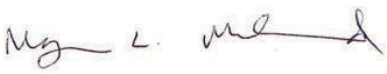
The biennial IGAC Science Conferences are successful due to three committees that work more than two years to make the conference a success. These are the Local Organizing Committee, Scientific Program Committee, and Early Career Program Committee. These three committees spend numerous volunteer hours to put on the IGAC Science Conferences. In addition to these committees, the conferences are also a success due to the hundreds of volunteers that help judge early career poster presentations, run the timing for the plenary talks, staff the registration desk, and hold and participate in numerous side meetings.

In addition to the volunteers that make the conference a success, there are also hundreds of you that devote your time to making the **IGAC Activities** and **Working Groups** a success. IGAC currently has twelve activities and six working groups all with volunteer leadership and participation. Each of these Activities and Working Groups seek to advance international atmospheric chemistry research by building communities across geographical boundaries and disciplines.

The oversight of IGAC is through a volunteer **Scientific Steering Committee** (SSC). The IGAC SSC members enthusiastically and selflessly serve the broader IGAC community to foster community, build capacity, and provide leadership. The IGAC SSC members typically serve five plus years and do so because they see the value of having a strong and well-connected international atmospheric chemistry community.

It is a great honor for me to be able to work with all of you. Every day I am reminded how lucky am I am to serve a community of volunteers that have a desire to go beyond their duties at their normal jobs and take time to build a truly international IGAC community. What makes IGAC successful is YOU! I am forever grateful to all of you for making IGAC what it is.

Thank You!



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.

Thank you IGAC Co-Chair Mark Lawrence!

Mark Lawrence from the Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany served on the IGAC Scientific Steering Committee (SSC) from 2010-2014 and then as co-chair from 2015-2018. Mark has been an excellent leader to IGAC making sure its focus remains on fundamental scientific research while at the same time growing its connections to sustainability issues. Indeed, Mark, along with Allen Goldstein (former IGAC SSC co-chair 2013-2016), first drafted the IGAC Vision diagram back in 2011, which has guided IGAC's activities since then. Mark has also been a very strong supporter of the IGAC Early Career Program by supporting IASS/IGAC to develop curriculum for science-policy engagement training, teaching sessions at IGAC's Early Career Short Course, presenting "Time Management" as part of the Early Career Program at IGAC Science Conferences, and always being available to speak and provide advice to early career scientists. In addition, Mark also served on both Local Organizing and Scientific Program Committees for IGAC biennial science conferences. Mark's contributions to IGAC will have an impact for many years to come. On behalf of the IGAC community, THANK YOU Mark for your years of service and leadership on the IGAC SSC.

"Mark and I first met at the IGAC-2 workshop held in Stockholm in January 2002, when we were still early career scientists. Since then Mark has always been around me in the IGAC community. As a senior co-chair, as a colleague and as a friend, Mark always provided me a lot of help, encouragements and suggestions. Mark is my IGAC brother! Thank you so much!"

– HIROSHI TANIMOTO, IGAC CO-CHAIR

IGAC Welcomes James Crawford as the new IGAC Co-Chair

James (Jim) Crawford from The National Aeronautics and Space Administration (NASA), USA will replace Mark Lawrence as co-chair of the IGAC SSC starting January 2019. Jim has served on the IGAC SSC as a member since 2015 and has played a key role in co-leading the Atmospheric Composition and Asia Monsoon Activity (ACAM). Jim is well known for coordinating NASA Tropospheric Chemistry Program airborne field studies across the globe, such as DISCOVER-AQ and KORUS-AQ. Jim insights on measurements, satellite observations, and modelling are a tremendous asset to the IGAC community. IGAC welcomes Jim 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 2018, in addition to Mark Lawrence, three members of the IGAC Scientific Steering Committee completed their service. IGAC is very grateful for the years Colette Heald (MIT, USA), Ally Lewis (University of York, UK), and Nouredinne Yassaa (CDER, Alegeria) served on the SSC. They will be greatly missed.

IGAC Welcomes Three New SSC Members

At the start of 2019, IGAC will welcome the three new members to its Scientific Steering Committee.


Lisa Emberson


Pieternel Levelt


Abdus Salam

LISA EMBERSON is the Centre Director of the York office at the Stockholm Environment Institute (SEI) and a Professor of Environmental Science in the Environment and Geography Department, at the University of York. She has over 20 years experience in the field of modelling soil-plant systems for assessment of the risk of impacts of air pollution and climate change on agriculture (arable and grassland productivity), forest productivity and the functioning of productive grasslands. More recently, she has been developing plant modelling methods capable of integrating Earth Observation data to improve impact assessments for global vegetation. She has also been working with AgMIP (the Agricultural Model Intercomparison and Improvement Project) to develop ensemble model applications to understand the role of air pollution and climate change on future crop supply under a range of future atmospheric environments and climate change.

Since joining SEI she has developed research activities in Africa, Asia and Latin America investigating the effects of a range of air pollutants (SO_2, NOx, O_3, SPM and fluorides) and climate change on both agro- and forest ecosystems with a view to investigating the subsequent impacts on social and economic systems. She also continues to have an active research role in Europe, developing deposition methodologies for use within the UNECE Long Range Transboundary Air Pollution Convention. This research has been instrumental in developing flux based Critical Levels to guide emission reduction policy across Europe. She has been involved in a UNEP global assessment to assess the efficacy of measures to control short-lived climate pollutants (SLCPs) (black carbon and ozone) to the benefit of climate, human health and agricultural productivity, she sits on the Scientific Advisory Panel of the Climate and Clean Air Coalition. She was also lead author on the European air quality policy chapter in UNEPs Global Environment Outlook report (GEO5). She is author of over 50 referred journal papers, and many articles, reports and book chapters and lectures on 'land use change & management' and 'environmental health' in the Environment and Geography Department of the University of York.

PIETERNEL LEVELT studied Chemistry at the Free University of Amsterdam, and obtained her Master degree in 1987 in Physical Chemistry. She did her PhD at the Physics department of the Free University of Amsterdam, building an XUV laser and performing spectroscopy and obtained her degree in 1992. In 1993, she started working at the Royal Netherlands Meteorological Institute (KNMI) on satellite data-assimilation in atmospheric chemistry models and on the validation of the European satellite instruments GOME and SCIAMACHY. In 1998, she became Principal Investigator (PI) of the OMI instrument (launched on NASA's EOS-Aura satellite in 2004) and she is still responsible for the international scientific program of OMI. She is the scientific founder of the new Dutch/ESA TROPOMI satellite instrument (PI from 2003-2009), launched in 2017 on the ESA/EU sentinel-5 precursor. In September 2007 she became part-time Professor in Satellite observations of the atmosphere at the Technical University in Eindhoven. She switched to the Technical University of Delft in 2011, where she held her inaugural address in 2012. In October 2009 she became Head of the Climate Observations Department at KNMI, later transformed to R&D Satellite Observation Department at KNMI, that is amongst others responsible for the OMI and TROPOMI PI projects. She is a member of the Mission Advisory Groups (MAG) at ESA for the EU Copernicus sentinel 4, 5 missions and chaired ESA's s5-precursor/TROPOMI MAG. Other advising positions include: ESF European Space Science Committee (ESSC) (2008- 2014), International Ozone Commission (IO3C), and

TNO Industry Advisory Board. Her scientific expertise lies in performing and interpreting satellite observations of the Earth's atmospheric chemical composition in the context of climate change, air quality and the ozone layer. Currently she leads the scientific team for the new nano satellite instrument TROPOLITE/SPECTROLITE, which will enable 1 x 1 km^2 air quality and emission measurements from space. Since May 2016 she is also Professor at NUIST University in Nanjing, China, where she also initiated the KNMI-NUIST co-operation centre on atmospheric composition. She has been visiting scientist at NCAR-ACD in Boulder, CO, USA in 1997 and 2018, and at NASA GSFC, Washington DC in 2007.

DR. ABDUS SALAM is a full Professor in the Department of Chemistry, University of Dhaka, Bangladesh. After completing his BSc (Hon's) in Chemistry and MSc in Physical Inorganic Chemistry, University of Dhaka, he completed his PhD degree in the Technical University of Vienna, Austria. He did his Postdoctoral research in the Department of Physics and Atmospheric Science, Dalhousie University, Canada. He was also working as a visiting scientist in the center for Atmospheric Chemistry, York University, Canada.

He is the principal investigator of two monitoring stations for atmospheric pollution and chemistry studies in Bangladesh. He has been leading a group of 25 members including PhDs, MS, and 4th year projects students. He has been collaborating with many international organization including NASA, USA; SPARTAN, Dalhousie University, Canada; StratoClim, AWI, EU project; Stockholm University, Sweden, etc.

His research interests are on air quality monitoring and characterization in urban and background locations, fog and rain water chemical composition, sources identification, biomass burning, brick kilns and traffic emission, black and brown carbon, human health and climate impact.

IGAC is accepting nominations for the 2020 SSC

IGAC welcomes nominations to its Scientific Steering Committee (SSC) from the international community. IGAC is currently accepting nominations for the 2020 SSC. For information on serving on the IGAC SSC, please see **The Expectations and Role of IGAC SSC Members**.

IGAC accepts both nominations and self-nominations at **igacproject.org/IGAC_SSC_nominations**.

Nominations will be accepted until **15 March 2019**.

Congratulations James Drummond!

Former IGAC SSC member James Drummond (2007-2011) was recently awarded "The Royal Canadian Geographical Society – Marin Bergmann Medal for Excellence in Arctic Leadership or Science 2018". His contributions in furthering Arctic research include his establishment of PEARL (Polar Environment Atmospheric Research), the globally-recognized Arctic flagship observatory that has contributed to a significant body of research. His enthusiasm for Arctic research has animated the CANDAC/PEARL Outreach Program that supports thousands of students, teachers, senior officials, and members of the diplomatic community.

Submit articles to the next IGACnews

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 Feb/Mar issue of the IGACnews is 15 February 2019. Send all submissions to **info@igacproject.org**.

Recent IGAC Fostered Publications

Open for comments

Alaskan Layered Pollution And Chemical Analysis (ALPACA) White Paper (2018). Lead Authors: W. Simpson, K. Law, J. Schmale, K. Pratt, S. Arnold, and J. Mao, **https://alpaca.community.uaf.edu/files/2018/11/ALPACA-whitepaper-30Nov2018.pdf**.

Deadline for comments is **30 January 2019.**

The ALPACA study has been developed under the umbrella of PACES Working Group Two (WG2), which focuses on the interactions between Arctic air pollution and Arctic societies, and local sources of Arctic air pollution. The aim of ALPACA is to investigate emissions and chemical and meteorological influences on air pollution in Fairbanks, AK, USA. This study will shed light on the wintertime air pollution in many urban areas and areas affected by industrial activities in the Arctic and sub-Arctic regions.

PACES
air Pollution in the Arctic:
Climate Environment and Societies

TOAR
tropospheric ozone assessment report

The assessment report is being published as a series of papers in the peer-reviewed journal, *Elementa – Science of the Anthropocene*. Papers published so far are available through a **Special Feature** of Elementa:

- Mills G, Pleijel H, Malley CS, Sinha B, Cooper OR, Schultz MG, Neufeld HS, Simpson D, Sharps K, Feng Z, Gerosa G, Harmens H, Kobayashi K, Saxena P, Paoletti E, Sinha V, Xu X, Tropospheric Ozone Assessment Report: Present-day tropospheric ozone distribution and trends relevant to vegetation. *Elem Sci Anth. 2018*; 6(1):47. DOI: **http://doi.org/10.1525/elementa.302**
- Gaudel, A, et al. 2018. Tropospheric Ozone Assessment Report: Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation. *Elem Sci Anth.*, 6: 39. DOI: **https://www.elementascience.org/articles/10.1525/elementa.291**
- Lefohn AS, Malley CS, Smith L, Wells B, Hazucha M, Simon H, Naik V, Mills G, Schultz MG, Paoletti E, De Marco A, Xu X, Zhang L, Wang T, Neufeld HS, Musselman RC, Tarasick D, Brauer M, Feng Z, Tang H, Kobayashi K, Sicard P, Solberg S, Gerosa G. Tropospheric ozone assessment report: Global ozone metrics for climate change, human health, and crop/ecosystem research. *Elem Sci Anth. 2018*; 6(1):28. DOI: **http://doi.org/10.1525/elementa.279**
- Fleming*, Zoë. L., Ruth M. Doherty*, Erika von Schneidemesser, Christopher S. Malley, Owen R. Cooper, Joseph P. Pinto, Augustin Colette, Xiaobin Xu, David Simpson, Martin G. Schultz, Allen S. Lefohn, Samera Hamad, Raeesa Moolla, Sverre Solberg, Zhaozhong Feng (2018), Tropospheric Ozone Assessment Report: Present-day ozone distribution and trends relevant to human health, *Elem Sci Anth. 2018*; 6(1):12. DOI: **https://www.elementascience.org/article/10.1525/elementa.273**
- Young*, P. J., V. Naik*, A. M. Fiore, A. Gaudel, J. Guo, M. Y. Lin, J. L. Neu, D. D. Parrish, H. E. Rieder, J. L. Schnell, S. Tilmes, O. Wild, L. Zhang, J. R. Ziemke, J. Brandt, A. Delcloo, R. M. Doherty, C. Geels, M. I. Hegglin, L. Hu, U. Im, R. Kumar, A. Luhar, L. Murray, D. Plummer, J. Rodriguez, A. Saiz-Lopez, M. G. Schultz, M. T. Woodhouse and G. Zeng (2018), Tropospheric Ozone Assessment Report: Assessment of global-scale model performance for global and regional ozone distributions, variability, and trends, *Elem Sci Anth. 2018*; 6(1):10. DOI: **http://doi.org/10.1525/elementa.265**
- Schultz, M. G. and 96 co-authors (2017), Tropospheric Ozone Assessment Report: Database and metrics data of global surface ozone observations, *Elem Sci. Anth, 5*. DOI: **http://doi.org/10.1525/elementa.244**
- Chang, K-L, I. Petropavlovskikh, O. R. Cooper, M. G. Schultz and T. Wang (2017), Regional trend analysis of surface ozone observations from monitoring networks in eastern North America, Europe and East Asia, *Elem Sci Anth.*, 5:50. DOI: **http://doi.org/10.1525/elementa.243**

Save the Date!

2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference

2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference Side Meeting Summaries

Thorsten Bartels-Rauch giving an overview of CATCH mission, vision and future plans to side meeting attendees at iCACGP-IGAC 2018.

CATCH Side Meeting Summary

Thorsten Bartels-Rauch, PSI, Switzerland

A CATCH side meeting was held on Wednesday September 26, 2018 during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference in Takamatsu, Kagawa, Japan. This meeting attracted ~25 early career and established scientists whose common scientific interest is atmospheric chemistry in cold regions of the Earth. The side meeting was a great opportunity for community members, whose individual research was otherwise scattered amongst the five conference sessions, to meet and discuss current and future research and scientific questions.

The idea and outcome of this CATCH side meeting was to collect the current and future research interests and needs of the community members, taking particular advantage of this opportunity to connect with community members in Asia. This was achieved by collecting 15 short presentations from community members in advance, that were presented in a "one-minute madness" style, following a brief tour of the CATCH mission and current status.

Following is a summary of the presentations:

- **Thorsten Bartels-Rauch** (CATCH co-chair) began the meeting by summarizing our mission and vision, and past and future activities, including the upcoming CATCH white paper in 2019 and Faraday Discussion in 2021.
- Thorsten started the open science discussion by sharing his research on snow and ice chemistry, with a focus on how impurities impact reactivity at the air-ice interface.
- Chirhiro Miyamoto (early career scientist, ECS, University of Tokyo) shared her research on the chemistry on Greenlandic ice cores using X-ray spectroscopy .
- Akihiro Yabushita (Kyushu University, Japan) discussed formation reactions of molecular iodine in ice.
- Keiichiro Hara (Fukuoka University, Japan) shared his interests in aerosol at the sea ice surface, with hopes to gain more quantitative information on aerosol fluxes.
- Norimichi Takenaka (Osaka Prefecture University) talked about his work on nitrogen chemistry in ice, snow/

ice photochemistry and trace gas measurements.

- Mang Lin (ECS, Tokyo Institute of Technology) shared his work on nitrate chemistry in the Tibetan plateau using stable isotopes.
- Shohei Hattori (Tokyo Institute of Technology) & Sakiko Ishino (ECS, Tokyo Institute of Technology) shared their work on isotopic measurements in aerosol and ice cores in Antarctic; they aim to understand the relationship between ice core isotopic signatures and atmospheric chemistry.
- **Kimberly Strong** (University of Toronto) shared the research taking place at the Polar Environment Atmospheric Research Laboratory (**PEARL**) in Eureka, NU, Canada (80N), emphasizing possibilities for collaboration through CATCH.
- Imran Girach (ECS, Vikram Sarabha Space Center, India) talked about the new Antarctic station Bharati, and summer measurements ozone and aerosol.
- Ruhi Humphreys (ECS, CSIRO, Australia) talked about measurements on Australian research vessels, a new mobile GAW site that operates 300 days a year, and the new Southern Ocean & Antarctic aerosol activity (SOUNAA).
- **Hélène Angot** (ECS, CU Boulder) shared her interests in the cycle of contaminants (e.g., Hg) on polar snow and ice.
- Detlev Helmig (CU Boulder) shared the recently funded project Atmospheric Tracers for Arctic Wildfires, Air Pollution, Atmospheric Chemistry and Climate Change at GEOSummit, Greenland, which will add new measurements to the Summit measurement suite.
- Claudia Volosciuk (WMO) announced the WMO High Mountain Summit to the CATCH community.
- **Jo Browse** (University of Exeter) discussed our understanding Arctic nucleation processes, and opportunities for collaboration to improve model representations
- Daiki Nomura (Hokkaido University, Japan) shared his work on sea ice biogeochemistry, air-sea ice gas fluxes, and upcoming work with MOSAiC.

These community discussions help us to constantly update the scope and tasks of CATCH. Discussion continued during our dinner with excellent Japanese cuisine, thanks to the local organizers!

GEIA Side Meeting Summary

Greg Frost, NOAA, USA

The Global Emissions InitiAtive (GEIA) held a side meeting at the 2018 joint iCACGP Symposium/IGAC Conference in Takamatsu, Japan, on the evening of Wednesday, 26 September. Approximately 40 people attended the meeting.

Greg Frost, GEIA Co-Chair, presented an overview of GEIA's organization. He discussed activities of GEIA's Working Groups (WGs) and highlighted collaborative projects of interest to the GEIA community, including the Community Emissions Data System and IGAC's new Analysis of eMIssions usinG Observations (AMIGO) project. Dr. Frost also promoted the upcoming GEIA Conference in Santiago, Chile, 6-8 November 2019.

Cathy Liousse, a member of GEIA's Scientific Steering Committee, promoted a nascent GEIA African Emissions WG. Dr. Liousse discussed the motivation for forming this WG, its objectives, and some planned activities. The African Emissions WG was enthusiastically received by the meeting participants, and numerous suggestions were offered for the WG activities. Many suggested that a key first step of the WG is to collect more data on emission factors and source activity in various African nations. Members of other regional GEIA WGs, including the Latin America/Caribbean WG, offered their experiences on starting their

groups. A suggestion was made to compare emission factor methods between Africa and Latin America. Members of the GEIA and IGAC communities are encouraged to participate in the African Emissions WG; those interested can contact **Cathy Liousse**, **Sekou Keita**, or **Mogesh Naidoo**.

The rest of the side meeting time was devoted to an open discussion between attendees. Discussion topics included:

- The possibility of forming a GEIA WG focused on the linkages between emissions science and policy;
- The need to discuss progress in methods for developing emission factors from a variety of sources, particularly in the developing world;
- Some iLEAPS activities of interest to GEIA;
- The value of understanding temporal variations in emissions;
- The possibility of a future GEIA WG aimed at delivering emissions for various applications, such as near-real-time emissions for operational forecasting.

IGAC MANGO Side Meeting

Hiroshi Tanimoto, NIES, Japan

IGAC-MANGO was established with the ultimate goal to form a cohesive network of atmospheric scientists in the Asian monsoon region, facilitate collaboration between Asian and international scientists, and foster the next generation of scientists in this region. During the 2018 joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference held in Takamatsu, Kagawa, Japan, the IGAC-MANGO Side Meeting was held to bring together the MANGO community to meet in person and to introduce current and future activities of IGAC-MANGO. Forty-five scientists attended the meeting. The meeting was kicked off by an introduction of the purpose and brief history of MANGO, followed by detailed explanations of its background and the review of the past two workshops. Then, current membership and activities are presented, including what scientific activities the MANGO community can contribute to and how MANGO is contributing to the capacity building activities of IGAC. Discussions were made to enhance communication between scientists in Monsoon Asia, and the collaboration of Asian community to the international community for IGAC-related scientific questions, and explore opportunities for funding and infrastructure that are needed to foster scientific research, capacity building, and regional collaborations. What is unique about this year's meeting is the participation of a total of 26 early career scientists from at least 10 countries in the MANGO region (Malaysia, India, Bangladesh, Singapore, Japan, Pakistan, Philippines, Taiwan, Korea, and Vietnam). The participation of the "MANGO Junior" in the meeting allowed them to visualize their future roles when they themselves take on the responsibilities of senior scientists to ensure the continuity and sustainability of efforts to promote atmospheric chemistry in the region. For many of them, it was their first time to interact with other young scientists from the various MANGO countries.

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**.

33rd Annual IGAC SSC Meeting

23-24 SEPTEMBER 2018
RITSURIN GARDEN, TAKAMATSU, JAPAN

IGAC Sponsored

AUTHORS

Mark Lawrence, Institute for Advanced Sustainability Studies, Germany

Hiroshi Tanimoto, National Institute for Environmental Studies, Japan

HOST INSTITUTION

National Institute for Environmental Studies

FUNDING

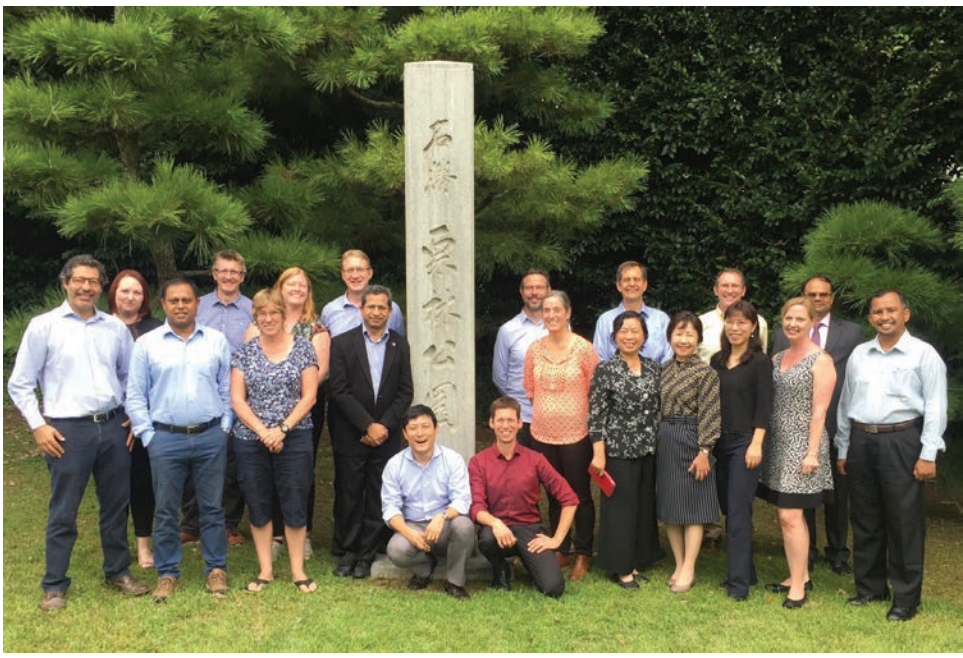
futureearth Research. Innovation. Sustainability

PARTICIPANTS

Australia, Bangladesh, Canada, China, France, Germany, India, Japan, Malaysia, Mexico, South Africa, Thailand, 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 16 members from around the world (current membership list at **igacproject.org/people**).



Participants of the 2018 IGAC SSC Meeting

Fourteen current SSC members, along with liaisons from several partner organizations, and one future SSC member, gathered in the beautiful Ritsurin Garden of Takamatsu, Japan, to discuss the ongoing activities, recent successes, and future plans of the highly-active international IGAC community. IGAC's mission, "facilitating atmospheric chemistry research toward a sustainable world," is realized by working in three main categories – "Fostering Community", "Building Capacity", and "Providing Leadership". This framing, now a few years old, has served very well to make IGAC's role in the community clear. The SSC meeting immediately preceded the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference in Takamatsu, Kagawa, Japan.

The SSC meeting opened with an update from the International Project Office (IPO), including the exciting news that a further 3 years of core funding from the US NSF, NOAA and NASA have been procured, for which the community is very grateful. This was followed by a discussion of future developments in the SSC composition, especially considering size and adequate representation of geographical regions and main topics within the atmospheric chemistry community. It was also decided that IGAC would immediately start accepting nominations for the 2020 IGAC SSC until 15 March 2019 (see **igacproject.org/IGAC_SSC_Nominations**).

Activities are a core aspect of IGAC (see **igacproject.org/Activities**), as are several national/regional working groups (see **igacproject.org/Working-Groups**). Updates were provided for all of IGAC's activities and working

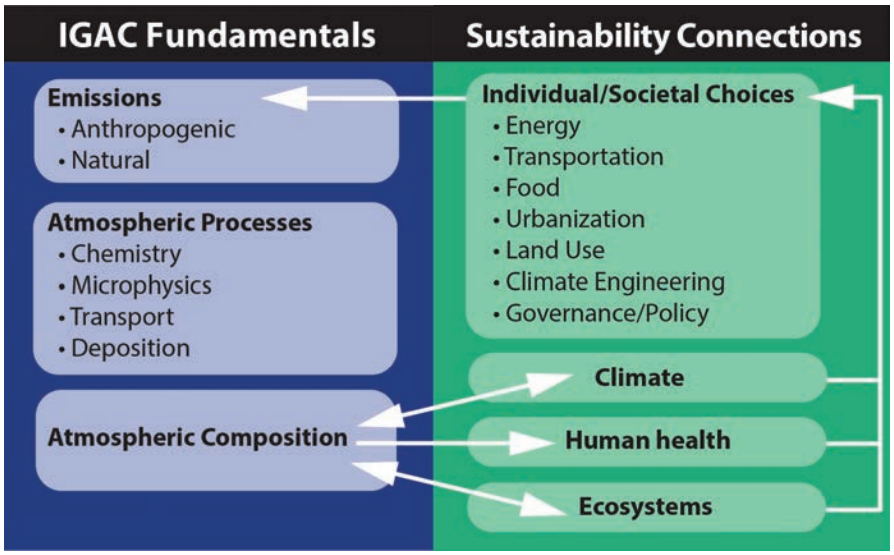
groups in the form of posters which were presented at the joint symposium/conference. The SSC also conducts in-depth reviews of selected activities and working groups each year, with generally a 3-year rotation cycle among the activities and working groups. This year, CATCH, DEBITS, AMIGO, and SPARTAN were reviewed. The progress within all of the reviewed projects was generally seen as commendable. World Café sessions focusing on the individual projects and working groups were used to gather feedback, which is being discussed with the activity leaders to help guide them in their future developments.

Looking to the future, we discussed the possibility of a visioning article, as well as a one-day visioning exercise as part of the next IGAC SSC meeting. We also discussed the venue and logistics of the 16th IGAC Science Conference, which will be held in Manchester, England, September 14th-18th, 2020. The chair of the local organizing committee is Hugh Coe of University of Manchester, and we're pleased that Paul Beukes, an IGAC SSC member from North-West University, South Africa, and Lucy Carpenter from York University, UK, have agreed to co-chair the scientific program committee. We look forward to another exciting conference and hope to see many of you again in 2020!

The SSC meeting ended with a joint session together with iCACGP, which started with a discussion of one of the most important contributions of IGAC to the community: its biennial Science Conference, which is held every other time jointly with the iCACGP Quadrennial Symposium. A final update about the joint conference/symposium was given by the Scientific Program Committee, the Local Organizing Committee, and the Early Career Program Organizing Committee, who worked hard over the last two years to put together an exciting program, highlighting key aspects of atmospheric chemistry focusing on the core theme "from molecules to global impacts", providing a venue conducive to scientific discussions, and designing a very active program for early career scientists.

The joint session then shared updates from iCACGP and IGAC, particularly about future membership, leadership and funding. IGAC would like to congratulate Melita Keywood on being selected as the next president of iCACGP, starting in 2019, and to thank John Burrows for his hard work as iCACGP president and fruitful interactions with IGAC over the past 8 years. On the IGAC side, Mark Lawrence will be rotating off after four years as the co-chair, and Jim Crawford will be joining Hiroshi Tanimoto as the new co-chair. Three new SSC members, from Bangladesh, the Netherlands and the UK will be joining in 2019. The complementary roles of IGAC and iCACGP in the community were discussed, as well as the collaboration on the next joint conference/symposium in 2022.

The SSC meeting finished with a presentation by Fumiko Kasuga, representing our other sponsor – Future Earth – as well as presentations by the liaisons from three of our main partners: WMO/GAW (World Meteorological Organization/Global Atmosphere Watch program), SOLAS (Surface Ocean - Lower Atmosphere Study), and iLEAPS (Integrated Land Ecosystem-Atmosphere Process Study). This was followed by a valuable discussion about the roles of IGAC and iCACGP in the current and future landscape of these programs and projects, which are focusing on various related aspects of the Earth system. In this, it became clear that IGAC is a thriving community and a very healthy project, which looks forward to continuing its valuable interactions with its sponsors and partners to help place our work on the fundamentals of atmospheric chemistry, as depicted in our vision diagram (see Figure 1), into the larger Earth system and sustainability context.



IGAC Vision Diagram

Postscript: Megan, Mark, and the rest of the SSC would like to sincerely thank Hiroshi Tanimoto for the incredible job he did leading the Local Organizing Committee for the joint conference/symposium, including organizing our very enjoyable and memorable SSC meeting!

22-24 SEPTEMBER 2018
SHODOSHIMA ISLAND, KAGAWA, JAPAN

IGAC Sponsored

AUTHORS

Sakiko Ishino, Tokyo Institute of Technology, Japan

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Megan Willis, Lawrence Berkeley National Institute, USA

Zitely Tzompa-Sosa, Colorado State University, USA

HOST INSTITUTION

National Institute for Environmental Studies

FUNDING

PARTICIPANTS

Argentina, Australia, Bangladesh, Brazil, Canada, China, Cote d'Ivoire, Finland, France, Germany, Hong Kong, India, Italy, Japan, Kenya, Malaysia, Mexico, Netherlands, Pakistan, Qatar, Russia, Singapore, South Africa, United Kingdom, United States, Venezuela, Vietnam

2018 iCACGP/IGAC Early Career Short Course

2nd iCACGP-IGAC Early Career Short Course Participants

Forty early career scientists representing 27 countries recently gathered at Shodoshima Island, Kagawa, Japan for the 2018 iCACGP/IGAC Early Career Short Course (ECSC), which provided an opportunity to learn and discuss a variety of content varying from emerging scientific topics among the atmospheric chemistry community to exploring science-policy engagement. Though some of the flights were cancelled due to heavy fog, which made us worry at the beginning that some participants would not make it, we were all finally gathered at the venue by the end of the first day and the short course went successfully after this point. The main goal of the short course was to foster international networks and collaborations 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 planet. Applications to attend the

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. Based on the success of the first IGAC Early Career Short Course, IGAC held the second 2018 iCACGP/IGAC Early Career Short Course prior to the 2018 joint iCACGP Symposium/IGAC Science Conference.

"Angel Road" in Shodoshima Island, Kagawa

ECSC far outpaced the number of available spots. Many worthy applicants had to be turned away.

The 2018 iCACGP/IGAC ECSC was composed of four sessions: (1) Connecting modeling, observations and laboratory studies, (2) The future of atmospheric chemistry, (3) Science-Policy engagement, and (4) World Café: Open discussion on global issues. Highlights from each session are presented below.

The short course began with the session entitled, "Connecting modeling, observations, and laboratory studies", which aimed to give participants an opportunity to think about how to make balanced connections among these three aspects of atmospheric chemistry. We heard talks by Dr. James Crawford (NASA, USA), Prof. Mei Zheng (Peking University, China), and Dr. Christian George (IRCELYON, France), about their experiences in developing and answering scientific questions that incorporate aspects of these sub-fields. Each talk was followed by a group discussion focused on our own experiences of connecting sub-fields in our work and on how we conceptualize building scientific questions that require interdisciplinary approaches. The speakers challenged us to examine about how we collaborate and develop scientific questions. The talks, and particularly the discussions, stimulated us to think about how to be more flexible and creative in our work.

The second session, "The future of atmospheric chemistry", was held in the latter half of the first day, and focused on three state-of-the-science topics of growing importance. Discussion on the first topic, climate engineering, was led by Prof. Mark Lawrence (IASS, Germany); he introduced us to possible climate engineering options and the role of atmospheric scientists in this area. Dr. Manish Naja (ARIES, India) introduced the current status and perspectives on air quality issues over Asia, and we discussed how such issues might change in the future.

Finally, Dr. Deborah Stein Zweers (KNMI, Netherlands) gave a primer on satellite-based measurements and shared the surprisingly fine-scale retrievals from the new satellite TROPOMI. This talk and discussion were an exciting way to end the first day.

The second day centered on a "Science-policy engagement" module developed by Dr. Rebecca Garland (CSIR, South Africa), Dr. Todd Sanford (Polygon Sun Research & Consulting, USA), Dr. Erika von Schneidemesser (IASS, Germany), and Dr. Megan Melamed (IGAC Executive Officer), and led by Dr. Garland and Dr. Sanford. This session began with clarification of the relationship between scientists and policy-making, followed by a panel discussion with several established scientists who are working at the science-policy interface. The discussion helped us to think about the possible options for science-policy engagement and how it relates to our own work. In the afternoon, we worked in groups on real-world science-policy scenarios to map possible approaches to engagement and problem-solving. This exercise allowed us to experience the importance, challenges, and complexities of science-policy engagement.

On the final day, we came together for a World Café style discussion to synthesize what we learned throughout the ECSC. We all enjoyed a very active discussion with many opportunities to listen to and exchange experiences with participants from many countries and regions. For detailed outcomes of this discussion, please see the Science Feature on page 21 of this issue of IGACnews.

The ECSC, through the sessions and free-time, fulfilled its role as a platform for interactive discussions and networking among the participants and instructors across geographical borders. The friendship among the ECSC participants triggered further networking among all early career scientists at the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference.

2018 joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference

25-29 SEPTEMBER 2018
TAKAMATSU, KAGAWA, JAPAN

IGAC Sponsored

Hiroshi Tanimoto, Chair of Local Organizing Committee

Tatsuya Nagashima, Local Organizing Committee

Satoshi Inomata, Local Organizing Committee

Colette Heald, Co-Chair of Scientific Program Committee

Melita Keywood, Co-Chair of Scientific Program Committee

Kohei Sakata, Co-Chair of Early Career Program Organizing Committee

Sakiko Ishino, Co-Chair of Early Career Program Organizing Committee

HOST INSTITUTIONS

Japan National Committee

JPSAC Japan Society of Atmospheric Chemistry

National Institute for Environmental Studies

SPONSORS

PARTICIPANTS

Argentina, Australia, Bangladesh, Belgium, Brazil, Canada, Chile, China, Cote d'Ivoire, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Israel, Italy, Japan, Kenya, Korea, Malaysia, Mexico, Myanmar, Netherlands, Norway, Pakistan, Philippines, Poland, Puerto Rico, Russia, Saudi Arabia, Singapore, Slovenia, South Africa, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, United Kingdom, United States, Venezuela, and Viet Nam.

Opening ceremony of iCACGP-IGAC 2018

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/conferences**). Every fourth year the conference is held in conjunction with the iCACGP quadrennial symposium, which in 2018 celebrated the 60th anniversary of the iCACGP. The joint iCACGP-IGAC 2018 was held in Japan after 24 years since iCACGP-IGAC 1994 held in Fuji-Yoshida.

View of Seto Inland Sea from Takamatsu, Kagawa, Japan

(Courtesy: Makoto Inoue/Sachiko Okamoto)

The 2018 joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference (iCACGP-IGAC 2018) was held 25-29 September 2018 in Takamatsu, Kagawa, Japan. iCACGP-IGAC 2018, with the theme "Atmospheric Chemistry: From Molecules to Global Impacts", 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 iCACGP-IGAC 2018 was a huge success with 733 participants representing 46 different countries. Early career scientists represented 40% of the attendees, highlighting vibrant and active research.

iCACGP-IGAC 2018 took place in the beautiful seaside town of Takamatsu, Kagawa, on the island of Shikoku. The weather was gorgeous, and attendees had opportunities to not only experience world-class research, but also exceptional scenery and exciting cultural activities. Upon leaving Takamatsu, the participants experienced typhoon Trami and prior to Trami, Thomas Sekiyama (JMA-MRI, Japan) provided a daily briefing on the weather forecast.

The five scientific sessions of iCACGP-IGAC 2018 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 and human dimension:

Session 1: Atmosphere chemistry and people

Session 2: Atmospheric chemistry and fundamentals

Session 3: Atmosphere chemistry and ecosystems

Session 4: Atmospheric chemistry and climate/weather

Session 5: Challenging the future

In addition to the 11 invited speakers and 56 oral presentations in these sessions, three keynote addresses were also given by Hajime Akimoto (NIES, Japan), Ian Galbally (CSIRO, Australia), and Maggie Tolbert

(University of Colorado, USA) on linking fundamental atmospheric chemistry to policy, the history of atmospheric chemistry, and particulate water in aerosols, respectively. Professor Yuan Tseh Lee (Academia Sinica, Taiwan), 1986 Nobel Laureate in Chemistry, also gave a presentation highlighting the challenges faced by atmospheric chemists and their achievements during the period of his distinguished career. In addition to the plenary oral presentations, 580 posters were presented throughout the week. As always, the time allotted for the poster sessions passed by too quickly due to overwhelmingly active interactions and intense discussions. In the evenings, 19 public side meetings were held, all of which had great participation.

iCACGP-IGAC 2018 and its Early Career Program were strongly supported by IGAC-Japan National Committee and Japan Society of Atmospheric Chemistry (JpSAC) as well as the LOC's host institution, National Institute for Environmental Studies (NIES). In total 37 conference sponsors from public and corporate sectors and 14 Early Career Program sponsors from international funders, university and institutions participated in the conference. Supported by local governments, an outreach program was held to disseminate atmospheric chemistry to the public. High-school students and their teachers were invited to the conference to see scientists and listen to various research topics in atmospheric chemistry.

During the banquet the participants were treated to the spectacular and moving "Shodo" performance with a theme of "CONNECT" by Takamatsu Commercial High School Calligraphy Club (Takasho-Girls) and iCACGP celebrated its 60th anniversary with the presentation of the Paul Crutzen Early Career Award to Manabu Shiraiwa (University of California – Irvine, USA), followed by a dance and music party with Swingin' Wonderland JAZZ Orchestra.

The Early Career Program was held throughout the week with the goal of encouraging networking and building collaborations among iCACGP-IGAC early career scientists (ECS). An evening social event and an excursion visiting Japanese cultural sites provided ECS with informal opportunities to meet new peers from around the world. A lunch event for ECS with more than 80 established scientists aided ECS to build connections with senior scientists. In addition, "ECS meet-up area" was open throughout the week to enhance further interactions including established scientists. To help ECS cultivate their perspectives and soft skills, lunchtime seminars with a variety of topics were given: "Dare to be different" by Yuen Tseh Lee (Academia Sinica, Taiwan), "Time management for ECS" by Mark Lawrence

Hajime Akimoto, Keynote Speaker

(IASS, Germany), "Social media as a scientist" by Paul Young (Lancaster University, UK), and "An Experience of Leading Science and Scientists" by Laura Gallardo (University of Chile, Chile). 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 Oral and Poster Presentation competition. Please read on to learn more about these inspiring early career scientists.

Passion is common around the world. We hope you enjoyed iCACGP-IGAC 2018 and made great memories, as well as shared your passion for atmospheric chemistry with your new friends and colleagues from around the world, beyond generations, countries, or any other boundaries. We strongly hope iCACGP-IGAC 2018 was something special for your future work, career, and life. We believe that the effects of the IGAC Science Conference and iCACGP Symposiums will continue for the decades, and all of you contribute to fostering the atmospheric chemistry community for decades to come.

Thank you for coming and joining us in Japan. We are grateful to the entire iCACGP/IGAC community for making iCACGP-IGAC 2018 such a fantastic week. It was a success because of you!

More information on iCACGP-IGAC 2018 can be found at **icacgp-igac2018.org**. We look forward to seeing all of you again in Manchester, UK for the 16th IGAC Science Conference in 2020.

25th International Symposium on Gas Kinetics and Related Phenomena

22-26 JULY 2018
UNIVERSITY LILLE, LILLE, FRANCE

IGAC Endorsed

AUTHOR

Christa Fittschen, University Lille - CNRS

HOST INSTITUTION AND FUNDING

FUNDING

PARTICIPANTS

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

BACKGROUND

IGAC has endorsed this symposium as part of its cross-cutting focus area on Fundamental Scientific Research (**igacproject.org/fundamental-scientific-research**). IGAC aims to continue expanding the capacity of the international atmospheric chemistry community to understand atmospheric composition by fostering *fundamental scientific research* on emissions and atmospheric processes.

GK2018 Lille Participants in the Plenary Hall of the Government of the region Hauts de France.

The Royal Society of Chemistry's 25th International Symposium on Gas Kinetics and Related Phenomena, was held at the Plenary Hall of the regional government of the Hauts de France region, France, from 22-26 July 2018. 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.

Nearly 200 scientists from 23 countries participated in a program consisting of over 170 presentations (10 plenary, 44 contributed talks and 120 posters) on themes as diverse as combustion chemistry, reaction dynamics, experimental methods, modelling of complex systems, nanoparticles and aerosols and 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 program and abstracts are available at **gk18.sciencesconf.org**.

The main square of Lille, France, the location of GK2018

The symposium was kicked off by a lecture in memorial of the late Ian Smith, which was given by Professor A. Ravishankara (Colorado State University) on *"Association Reactions: My Associations with Prof. Ian W.M. Smith"*. The symposium was concluded with the award of the prestigious RSC Polanyi medal and the giving of the Polanyi 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. The medal was awarded this year for the first time to a woman: Professor Barbara Finlayson-Pitts (University of California, Irvine). Barbara gave an enthralling lecture on the *"Multiphase Chemistry in the Atmosphere: It All Starts with Gases"*, including scientific highlights from her illustrious career, exciting current research and her thoughts for the future.

Alongside the science, delegates enjoyed a full and fun packed social programme, experiencing the delights of the historic city of Lille in unusually fine weather, even too fine on Thursday with the all time temperature record of 35.7°C! Excursions included a visit of the Fine Art Museum and a walking tour through Lille, a visit of the battle fields of 1st World War and a tour into the Flandern region north of Lille. The symposium gala banquet was held in a restaurant in downtown.

The 26th International Symposium on Gas Kinetics and Related Phenomena will be held in late August/early September 2020 at the University of Karlsruhe in southern Germany, near the border with France. For more information please contact the local organising committee (**matthias.olzmann@kit.edu**) 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 (**rsc.org/Membership/Networking/InterestGroups/GasKinetics/index.asp**).

An Early Career Perspective *on* Fostering the Next Generation *of* Atmospheric Scientists in an International Community

AUTHORS

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Manish Kumar, Banaras Hindu University, India

Kohei Sakata, National Institute for Environmental Studies, Japan

A group of forty international early career scientists came together at a three-day workshop made possible by the International Global Atmospheric Chemistry (IGAC) project and the international Commission on Atmospheric Chemistry and Global Pollution (iCACGP). We focused on a selection of topics that contribute to growth of leadership in the scientific community. These included connecting sub-fields in atmospheric chemistry, future directions for atmospheric chemistry, and science-policy engagement. From the perspective of early career scientists, this article outlines our vision for fostering the next generation of atmospheric scientists in an internationally collaborative atmospheric chemistry community.

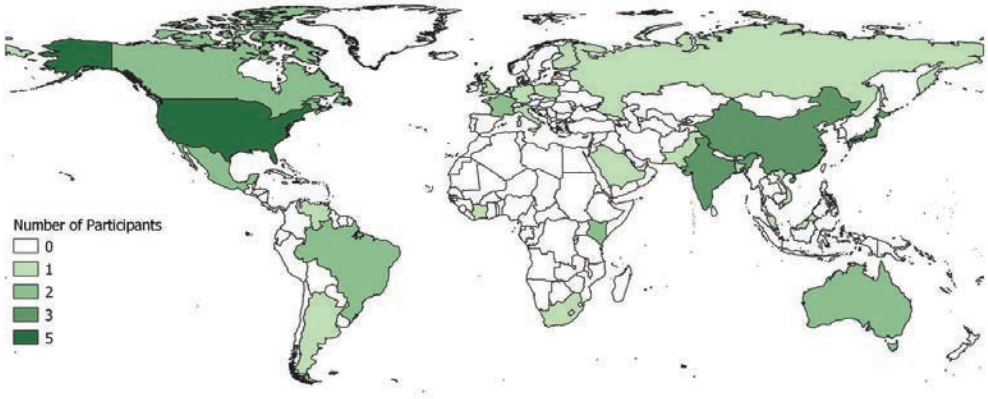

FIGURE 1: Geographical representation at the 2018 iCACGP-IGAC Early Career Short Course.

BACKGROUND

Based on the sessions and conversation from the 2018 iCACGP/IGAC Early Career Short Course, the Early Career Program Organizing Committee (ECPOC) wrote an article on the future of international collaborations and atmospheric chemistry from the perspective of early career scientists.

Fostering diversity, equity and inclusion in the atmospheric chemistry community

A strong basis for growing a diverse and inclusive international community of atmospheric scientists includes opportunities to come together to build relationships based on mutual respect and understanding. The best kind of opportunities go beyond only sharing science and create a space for sharing culture and language. This type of communication may happen naturally at international conferences, but national and international scientific organizations

can take an active role in facilitating intercultural and international connections in their communities. Conference sessions, meeting opportunities and conference social events focused on diversity, inclusion and equity in science are becoming more common, for example in the geosciences through the American, European and Japanese Geosciences Unions (1). While such venues provide an opportunity to discuss current efforts and remaining challenges for cultivating a culture of diversity, equity and inclusion, other types of opportunities, such as workshops or retreats with diverse attendees, can make a strong and lasting impact. The iCACGP-IGAC Early Career Short Course (ECSC) is one example of an opportunity created by an international scientific organization that allows a diverse group of early career scientists (ECS) to come together in both formal and informal ways that facilitate growth of mutual respect among scientists from diverse cultures and circumstances. ECSC participants expressed strong support for this model as a means of relationship building that can provide the groundwork for effective international scientific collaborations. However, for many ECS, especially those outside Europe and North America, such opportunities can be inaccessible, with little institutional or financial support.

Our community will continue to grow collaboration across borders and continents, with a particular need for fostering cooperation between countries and institutions with significant resources and those in emerging or resource poor regions. For example, these efforts may take the form of intensive field work and building long-term monitoring infrastructure in locations lacking measurements, or sharing computing resources for theoretical work. Importantly, care must be taken to support the interests and needs of scientists in emerging or resource poor regions; flexible and open consultation is required to ensure that international collaboration truly benefits all people involved."

The lack of equitable opportunity and international representation in our scientific community creates an environment where scientists from countries outside Europe and North America have limited access and feel they don't belong. The resulting power dynamic creates a huge barrier to equitable international collaboration, where not all contributors are heard or able to address the scientific questions most relevant or interesting to them. The beginning of potential solutions lies in coming together on a common ground of mutual respect and talking about our culture, our history, the science we do and how this science is shaped by our cultures and circumstances. Potential solutions would include not only holding international meetings, but also encouraging scientists to spend time working in a different country and gaining experience of a new culture. Organizations such as iCACGP and IGAC play a critical role in disseminating international opportunities to the community and opening opportunities to international established and early career scientists in an equitable way.

The future of atmospheric chemistry is an interconnected community

The atmospheric chemistry community is inherently interdisciplinary, and requires continued growth in its connections within and outside the field in three main ways. First, our community will continue to grow collaboration across borders and continents, with a particular need for fostering cooperation between countries and institutions with significant resources and those in emerging or resource poor regions. For example, these efforts may take the form of intensive field work and building long-term monitoring infrastructure in locations lacking measurements, or sharing computing resources for theoretical work. Importantly, care must be taken to support the interests and needs of scientists in emerging or resource poor regions; flexible and open consultation is required to ensure that international collaboration truly benefits all people involved.

Second, our community will continue to grow its capacity for open, accessible knowledge and data sharing. For example, within our community resources related to satellite-based observations are often freely accessible, and access can be hindered by the complexity of processes required to obtain or manipulate the data. Efforts are necessary to improve communication and knowledge sharing both within and outside the scientific community. As data and knowledge sharing becomes an integral part of the atmospheric community, graduate and undergraduate training must reflect the requirement for relevant technical and communication skills.

FIGURE 2: Word cloud showing the results of word-frequency analysis of discussion responses to the question, "How can we foster a diverse and inclusive community in atmospheric chemistry?"

Finally, our community will continue to push toward more extensive collaboration with other fields of science. Collaboration with health researchers improves our understanding of the impacts of poor air quality across the world. Collaboration across areas of Earth system science continues to drive how we understand interactions between the lithosphere, hydrosphere, atmosphere and the biosphere. Collaboration in policy-making connects our scientific work with societal needs, such as improving air quality and facilitating climate change mitigation and adaptation. Meaningful and productive trans-disciplinary collaboration is often made possible by funding mechanisms that support large, interdisciplinary research networks. Such networks can provide invaluable opportunities for ECS.

Atmospheric chemistry is itself growing to encompass new areas and developments; including indoor air quality, application of low-cost sensors that allow us to derive fine-scale urban emissions, increasing spatial resolution of space-based atmospheric observations and high-resolution models to keep up with our increasingly detailed knowledge of the atmosphere. Many of these efforts require collaboration between sub-fields in atmospheric chemistry, which is discussed next. As our field grows and changes, we need to acknowledge the threat to fundamental laboratory studies that provide the molecular level underpinning for our knowledge of atmospheric chemistry. We need to ensure this expertise is not lost, by working across sub-disciplines to relate this fundamental research to the big picture.

Effective communication drives productive and meaningful collaboration

Broad and interesting scientific questions in atmospheric chemistry, climate and air quality drive us to work across sub-disciplines in our field and outside our field. Equitable and productive efforts require that we communicate effectively across disciplinary divides. Effective communication is crucial to conceptualizing mutual goals and interests among scientists focusing on modelling, field observations and laboratory experiments. We need to be able to clearly communicate the strengths and limitations of our own work, while listening to and understanding others with potentially vastly different perspectives on

the same issue. A sense of disciplinary, geographical or cultural hierarchy can arise within collaborations, which detracts from our ability to make the best use of the diverse expertise and experience that exists in our community. Unbalanced dynamics can also arise around the issue of assigning credit in collaborative projects. By acknowledging these power dynamics, we can examine our own role in them and develop ways to promote diverse perspectives both geographically and scientifically.

Explicit training in effective communication is lacking for ECS, and is generally not part of a conventional scientific graduate education. Programs that teach interdisciplinary skills, such as effective communication and other leadership skills, foster the next generation of collaborative scientists and promote effective mentorship (2). Such programs can be implemented in seminar series, courses and workshops that would ideally bridge geographical, cultural and language barriers. Strategies for communicating across these barriers become particularly important in the context of international collaboration; for example, as our community continues to work toward better observational coverage across the globe or as we work to influence policy.

Atmospheric chemists can make meaningful contributions to evidence-based policy

All research in atmospheric chemistry makes direct and indirect contributions to policy, or supports policy implementation. However, ECS are often not aware of what these opportunities look like. When we are engaged in applied science it may be easier to immediately identify how our work contributes to evidence-based policy. When we are engaged in fundamental research we often identify our roles more in supporting policy by building the scientific basis that leads to a better understanding of the atmospheric system, and reducing uncertainty.

This spectrum of science-policy engagement provides a range of opportunities for early career scientists; some may have dissertation or research requirements for policy linked with impact and others may make no discernable policy interaction in their research. Scientific publication of our research often prevents us from making direct connections with policy in the main body of the work, but opportunities arise to include policy relevant supplementary material or to participate in writing advisory documents.

Training in science-policy engagement can help to demystify the process for creating evidence-based policy by, for example, distinguishing between policy, regulation and law, identifying where in the policy cycle we can engage, helping us to think about windows of policy opportunity and expanding our understanding of policy formulation versus implementation. As scientists, we are often aware that research supports policy and regulation, but we need more than only our scientific background to work effectively with policy makers and communities.

National and international organizations, along with smaller institution-based groups, provide opportunities for ECS to develop skills to effectively engage at the interface between science and policy according to their own aptitudes and interests (3). More opportunities and training are necessary to help scientists create accessible and engaging summaries of their work; to collaborate with artists and designers to create attractive and informative visualizations; and to translate their research findings to the public, ideally in their own native languages, through articles, blogs and social media. Importantly, engagement in activities at the science-policy interface may not be viewed as an important part of developing a scientific career, and this can create significant barriers for early career scientists interested in science communication and science-policy.

Conclusions

Scientific organizations and institutions can support the professional and personal growth of early career scientists in the following ways:

- Provide concrete and funded opportunities for early career scientists to engage with the international community and build cross-cultural connections.
- Build capacity by creating opportunities for early career scientists to learn diverse communication, mentorship and leadership skills.
- Create mechanisms for recognition of science communication and science-policy engagement and create space for early career scientists to engage in these activities alongside research.

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Martin van Damm

Early Career Oral Presentation Award

2018 joint 14th iCACGP Quadrennial Symposium/
15th IGAC Science Conference

Martin Van Damme grew up in Charleroi, Belgium and moved to Brussels to study. He started his education at the Université Libre de Bruxelles (ULB) with a Master in Bio-engineering and a master thesis was carried out in the "Atmospheric Spectroscopy" group. It was in the context of this thesis that Martin first started working on atmospheric ammonia (NH_3). The year after that Martin pursued a master in political science with a thesis on the positioning of African countries during the 2009 Copenhagen Summit. In 2010, he returned to the "Atmospheric Spectroscopy" lab to write a PhD thesis on the remote sensing of atmospheric NH_3 and its global assessment. The PhD was carried out under the joint supervision of P.-F. Coheur at ULB and J.W. Erisman at the "Vrije Universiteit Amsterdam (VU)". This framework gave Martin the opportunity to benefit from the trace gas remote sensing expertise from the group at ULB and the expertise on the biogeochemical cycles from the "Earth and Climate Cluster" at VU. Martin is currently a postdoctoral researcher at ULB where his research interests are on providing better constraints on ammonia distributions, emissions, sources and transport, and on better assessing its impacts on the biosphere. Martin and colleagues at ULB developed a powerful retrieval algorithm able to extract the spectral signature of atmospheric trace gases from satellite measurements of infrared spectra. Their research is at present deeply connected to the Infrared Atmospheric Sounding Interferometer (IASI) mission. Current research activities related to NH_3 include the improvement of the retrieval algorithm for IASI and the creation of a "climate" decadal record allowing to assess emission trends.

What got you involved in this area of research and is there an element or aspect of your research you believe to be particularly important?

I was fortunate enough to be involved in the analyses of the very first global distribution of NH_3 that was obtained from space measurements. It was very exciting to investigate the main sources and their evolution. The unexpected ability of satellite sounders to measure NH_3 at global scale with a relatively high spatial and temporal resolution triggered the use of satellite data in various scientific communities (air quality, reactive nitrogen, etc.). Many fruitful collaborations arose from it, and we hope that some small steps forward were achieved thanks to this new remote sensing tool of NH_3.

Pursuing or earning a doctorate degree in the field of atmospheric chemistry is not an easy task. What challenges have you had to overcome to get to where you are now?

A challenge was to stay focused on the PhD objectives and to be disciplined enough to switch from one objective, its achievement to the next ones. Keeping this motivation high and being scientifically productive throughout the whole PhD is not an easy task. I was lucky to be involved in a very motivating group, with strong postdoc and senior scientists, able to keep your motivation and involvement at a very high level.

How do you want your career to progress and where do you think you can ultimately have the greatest impact?

I hope to be able to stabilize my position in academic research and find a permanent post. If not, I would definitely like to work in NGOs or public sector trying to strengthen the link between scientists, their

achievements and the society. Being involved in policy-making processes is also something I would like to do.

What was the most interesting thing you learned and who was the most interesting person you met during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference?

I truly enjoy IGAC conferences a lot, as it brings together a broad panel of experts. Not being subdivided in numerous specialized sessions allows us to have a nice overview of what are the current atmospheric chemistry research outcomes and challenges. The early career scientists group was very dynamic and it was enriching on many levels to meet scientist from across the globe. I also had the opportunity to meet several researchers that, through their publications, inspired me and helped me in my research activities. It was really interesting to discuss with them and get their feedback on my work.

3.071 Ammonia revealed from space: from industrial and agricultural point sources to global trends.

Presenting Author

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Abstract

Ammonia (NH_3) is presently high on the political agendas, mainly because it severely deteriorates air quality through particulate matter formation, affecting human health by increasing mortality and morbidity. In this work, we use IASI satellite retrieved NH_3 measurement to identify, categorise and quantify world's NH_3 emission hotspots. In particular, using a spatial oversampling technique, we present a ten-year average, enabling us to identify over 200 agricultural and industrial hotspots with associated point sources. More than half relate directly to fertilizer industry, but also other industrial sectors emerge as major emitters of NH_3. While calculated satellite-based emissions over large source

regions are generally in line with what is reported in bottom-up emission inventories, our results suggest a drastic underestimation of point sources, in particular of industrial and agricultural origin. Using IASI to track NH_3 emission changes, temporal analysis revealed rapid shifts in anthropogenic activities, such as the opening or closure of industrial plants. These results demonstrate that using NH_3 satellite data will be hugely beneficial for improving conventional bottom-up emission inventories. We also derive trends on the region and global scales over the extended period covered by the IASI mission (from end of 2007 up to now) using a reanalysed dataset, in order to avoid the discontinuities identified in the near-real time dataset. Distinct patterns of emissions are extracted over the ten years of space measurements and these are analysed in light of anthropogenic activities occurring on ground.

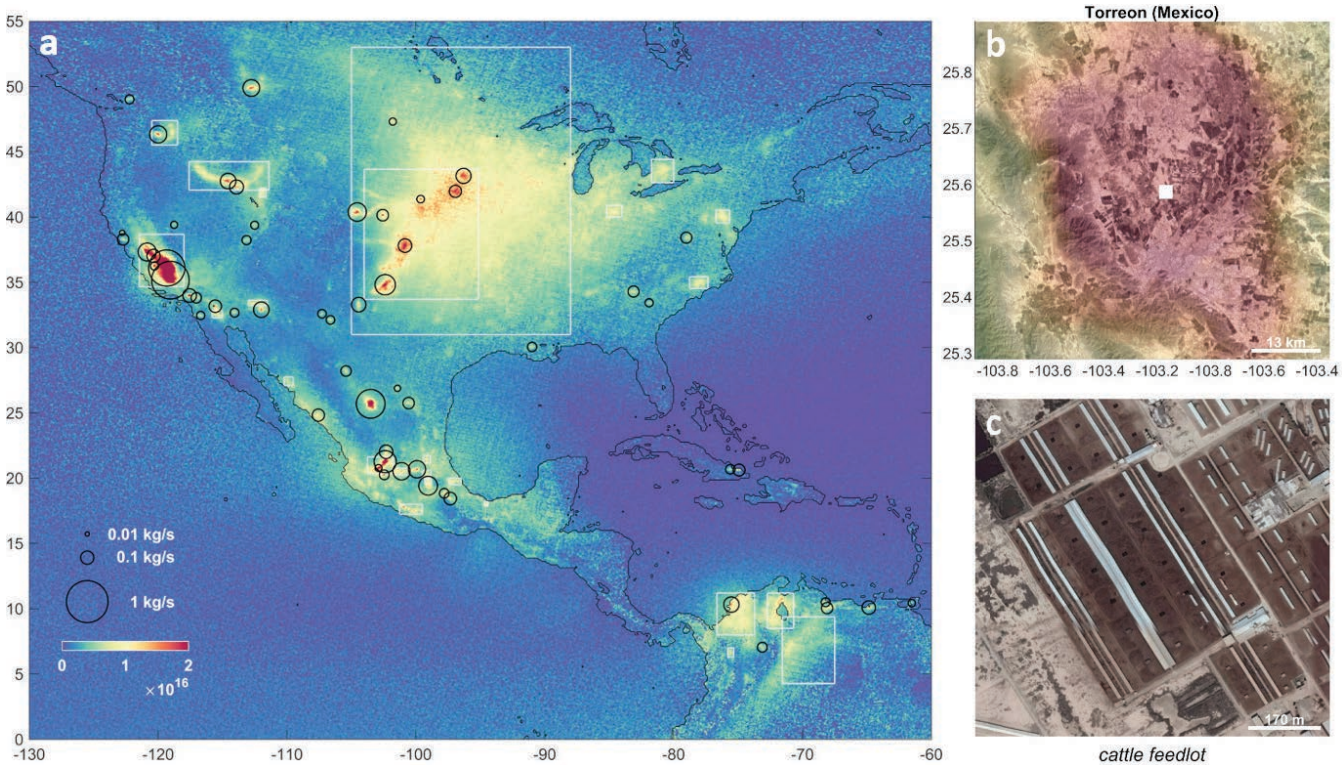


FIGURE 1. (a) Oversampled overage distribution of ammonia (molecules/cm^2) over Northern and Central America using almost a decade of IASI satellite measurements. Hotspots are identified with black circles which size quantifies the satellite-derived emission flux (kg/s). Large source regions are indicated with white rectangle. (b) Ammonia distribution (molecules/cm^2) overlaid on visible imagery in Torreon (Mexico), which is a typical example of a cluster of agricultural point sources. (c) Closer view (delineated by a white square in panel b) to one of the agricultural feedlots responsible for the large amount of ammonia emitted. Map data from Google Earth, CNES/Airbus, DigitalGlobe and Landsat/ Copernicus. Reference: Van Damme, M., Clarisse, L., Whitburn, S., Hadji-Lazaro, J., Hurtmans, D., Clerbaux, C., Coheur, P.-F. Industrial and agricultural ammonia point sources exposed. *Nature*, doi: **10.1038/s41586-018-0747-1, (2018)**.

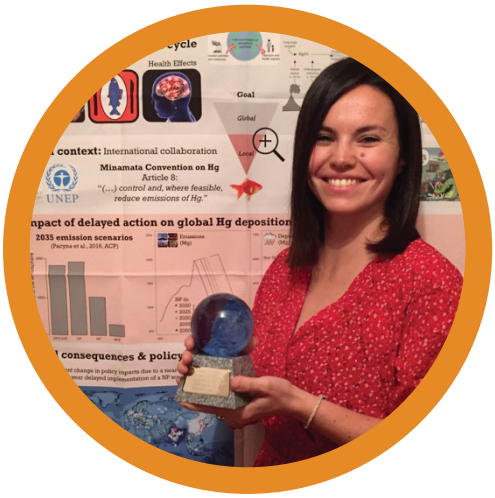
Hélène Angot

Early Career Poster Presentation Award

Session 1: Atmospheric Chemistry & People

2018 joint 14th iCACGP Quadrennial Symposium/
15th IGAC Science Conference

Hélène Angot was born and raised in Southern France. She received a Master degree in Chemical Engineering from the National Graduate School of Chemistry in Montpellier (France) and a PhD in Earth, Planetary and Environmental Sciences from Univ. Grenoble Alpes (France). Her research focuses on the sources and fate of harmful global pollutants using field observations and modeling techniques. After obtaining her PhD in November 2016, during which time she studied atmospheric mercury (Hg) in remote areas of the Southern Hemisphere (e.g., Antarctica), she became a postdoctoral associate at the Massachusetts Institute of Technology (MIT) in **Noelle Selin's group**, also working on Hg-related questions. Hg, emitted into air by multiple natural and anthropogenic sources (e.g., coal-fired power plants), is of global concern owing to its persistence in the environment, its ability to be transported far away from emission sources and to bioaccumulate to toxic levels in food webs. It is addressed under the global 2017 Minamata Convention that requires that countries control emissions from specific sources. While the Convention urges that countries take action as soon as possible, its requirements for controlling sources allow for up to a 10-year delay. Helene developed an integrated modeling approach to investigate the global and local consequences of delayed mercury mitigation efforts and presented the results of this work at the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference and in a **recently published paper** in Environmental Science and Technology. Since July 2018, Helene is a research associate in **Detlev Helmig's group** at the Institute of Arctic and Alpine Research (INSTAAR) in Boulder, CO where she is involved in two projects: the first one investigates the fate of ozone and biogenic volatile organic compounds (BVOCs) in an arctic tundra environment (Alaska), the second one aims at measuring trace gases at Summit to determine potential impacts from wildfire emissions in Greenland and the Arctic region.



What got you involved in this area of research and is there an element or aspect of your research you believe to be particularly important?

As far as I can remember, I have always been deeply concerned by environmental issues and fascinated by Polar Regions. I remember watching as a kid a documentary on polar bears and how climate change alters their habitat. I later discovered that polychlorinated biphenyls (PCBs) threaten bear populations after traveling long distances and condensing in the cold air. I probably try to pursue my childhood fascination by focusing nowadays on the sources and fate of harmful global pollutants, especially in Polar Regions. I think it is important to consider the Earth system as a whole and understand that human activities at lower latitudes heavily affect remote regions, such as the Arctic, and the local communities.

Pursuing or earning a doctorate degree in the field of atmospheric chemistry is not an easy task. What challenges have you had to overcome to get to where you are now?

International mobility is an important part of the research system as we gain skills and experience by working in other countries. While I really enjoy this and definitely try to make the most of it, mobility can really be challenging when it comes to reconciling professional and personal life, especially for women.

How do you want your career to progress and where do you think you can ultimately have the greatest impact?

I would like to pursue a career in academia. The Arctic is warming faster than any other region on Earth and is already undergoing rapid ecosystem change. In that context, I would like to investigate climate-driven changes in arctic biogeochemical cycles of contaminants, especially emerging sources such as wildfires and permafrost thaw.

What was the most interesting thing you learned and who was the most interesting person you met during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference?

The 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference was my first IGAC conference and I found it extremely inspiring and of high scientific quality. I have met new people and discussed common research interests but have also enjoyed spending time with old friends/colleagues. I attended the early career short course and had the amazing opportunity to meet people from literally all-around the world. That was probably the most rewarding part of the conference and a very good reminder of how fortunate we are in North America and Europe when it comes to research fundings.

1.081 Towards reduced human exposure to mercury: The need for near-term global action.

Presenting Author

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Abstract

Toxic pollutants, such as mercury (Hg), are emitted into air worldwide by multiple natural and anthropogenic sources. The atmosphere provides both a route of exposure (via inhalation) and a means for the efficient long-range transport and transformation of such pollutants in the environment. Through a modeling approach, we aim to draw the link between global emissions and local impacts of Hg. Hg is of global concern owing to its long-range atmospheric transport, its persistence in the environment, its ability to bioaccumulate in ecosystems, and its negative effects on human health. The UNEP Minamata Convention on Hg, a global treaty to protect human health and the environment from adverse effects of Hg, entered into force in August 2017. Under this Convention and as a co-benefit of greenhouse gases mitigation policies, global Hg anthropogenic emissions are expected to

decrease. Here, we investigate the consequences of delayed global action on global Hg atmospheric deposition and local contamination. Using a global multi-media Hg box-model, we find that, under a business- as-usual scenario, each 5-year delay in near-term peaking of Hg emissions in turns delays by additional extra 3 years the decrease of global Hg deposition to ecosystems under a given targeted threshold. In order to derive local-scale impacts, we use a combination of chemical transport modeling (GEOS-Chem) to predict local Hg deposition, and lake modeling to predict concentrations in fish. Here, we focus on remote tribal regions of Eastern Maine (USA) as Native Americans are particularly affected by Hg contamination due to their traditional dependence on subsistence fishing. We show that each 5-year delay in reducing global Hg emissions leads to a local 2% increase in atmospheric deposition to ecosystems. Consequences on fish contamination will also be discussed. Overall, our results underline the importance of near-term action for limiting the Hg burden of future generations.

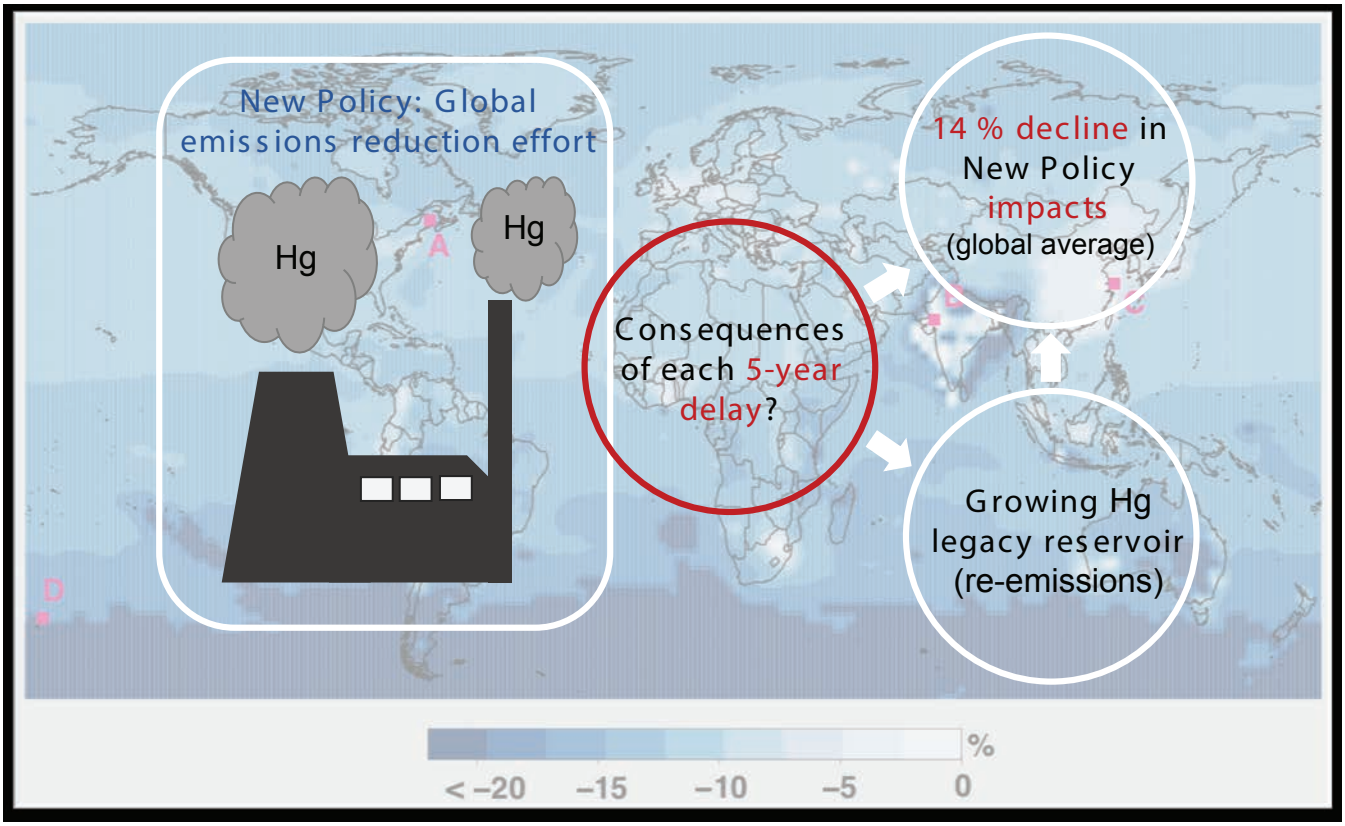

FIGURE 1. The longer mercury-controlling policies are delayed, the less effective they will be: for every five year delay, the impact of policy measures will be reduced by 14% on average. More information can be found in **Angot et al., 2018**.

Sidhant Pai

Early Career Poster Presentation Award

Session 2: Atmospheric Chemistry & Fundamentals

2018 joint 14th iCACGP Quadrennial Symposium/
15th IGAC Science Conference

Sidhant Pao was born in Pune, India and spent his childhood split between India and the US. He received his undergraduate degree in Environmental Engineering from MIT. After graduating from MIT, Sihant spent a few years working on a social enterprise in India. He came back to MIT in 2017 to start graduate school, studying Atmospheric Physics and Chemistry. Currently, Sidhant is a PhD student at MIT, studying Atmospheric Physics and Chemistry under Professor Colette Heald. His research uses computational models and statistical techniques (in conjunction with satellite and aircraft measurements) to simulate the transport and fate of various aerosol pollutants. Sidhant is particularly interested in studying ambient air quality and characterizing pollution sources over the Indian sub-continent.

What got you involved in this area of research and is there an element or aspect of your research you believe to be particularly important?

The Indian subcontinent is subjected to some of the highest levels of ambient air pollution in the world, negatively impacting human health, regional climate, crop yields, etc. I spent a large part of my childhood in India and suffered from Asthma when I was younger. The air quality over the region is thus of personal significance to me, and I feel especially invested in understanding the problem and contributing to a solution. I studied environmental science as an undergrad and spent most of my senior year working on low-cost sensors to monitor ambient air quality. During the course of that experience, I found myself drawn to the underlying science and was interested in pursuing it further. I am also passionate about social and environmental justice, and found that my work on air quality intersected with both these fields, making it an attractive research area.

Pursuing or earning a doctorate degree in the field of atmospheric chemistry is not an easy task. What challenges have you had to overcome to get to where you are now?

The path to my current position as a PhD student has been relatively circuitous, with forays into the social enterprise and non-profit sectors. I think my varied experiences have helped me maintain a sense of perspective when dealing with challenges during the course of my PhD. I've also been very fortunate to have family, friends and mentors that helped me deal with various set-backs along the way

and leverage important opportunities when they presented themselves.

How do you want your career to progress and where do you think you can ultimately have the greatest impact?

The broad motivation behind my doctoral work is to better constrain the sources and atmospheric fates of various aerosol species over South Asia. I am still in the process of thinking through my career goals, but my aim is to ultimately collaborate with various stakeholders in India and use scientific results to inform policy decisions in order to improve ambient air quality in the region.

What was the most interesting thing you learned and who was the most interesting person you met during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference?

I think the most interesting things I learned were from individual conversations during the various poster sessions. It's hard to pick one particular person, but I met a number of senior scientists and students working on air quality issues in India and was excited by how knowledgeable and passionate they were about their work. The conference also allowed me to explore potential avenues of collaboration with experimental groups working in South Asia (to use data-sets from newly implemented research-grade measurement techniques) and I'm excited to see how these observations can better inform my research!

2.037 An Evaluation of Global Organic Aerosol Simulations of Varying Complexity using Airborne Observations.

Presenting Author

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Co-Author

Colette Heald, Massachusetts Institute of Technology, Department of Civil and Environmental Engineering, USA

Abstract

Chemical transport models have historically struggled to accurately simulate the magnitude and variability of organic aerosol (OA), with previous studies demonstrating that models significantly underestimate observed concentrations in the troposphere. In this study we explore different model OA schemes using the GEOS-Chem chemical transport model and compare the simulations to a suite of globally-distributed airborne observations from 2008-2017. These include the recent Korus-AQ and ATom campaigns and provide broad coverage over a diverse set of regimes – anthropogenic, biogenic, fire and remote. The evaluated model schemes span a range of formation mechanisms – including a simple fixed-yield parameterization, a volatility basis set, and an explicit treatment of IEPOX aqueous uptake. We also use the observations to optimize the fixed- yield approach for the various precursor types. The result of this analysis is an improved parameterized OA scheme that significantly reduces bias and improves model skill when compared to ambient observations while maintaining the computational advantage of a parameterized approach.

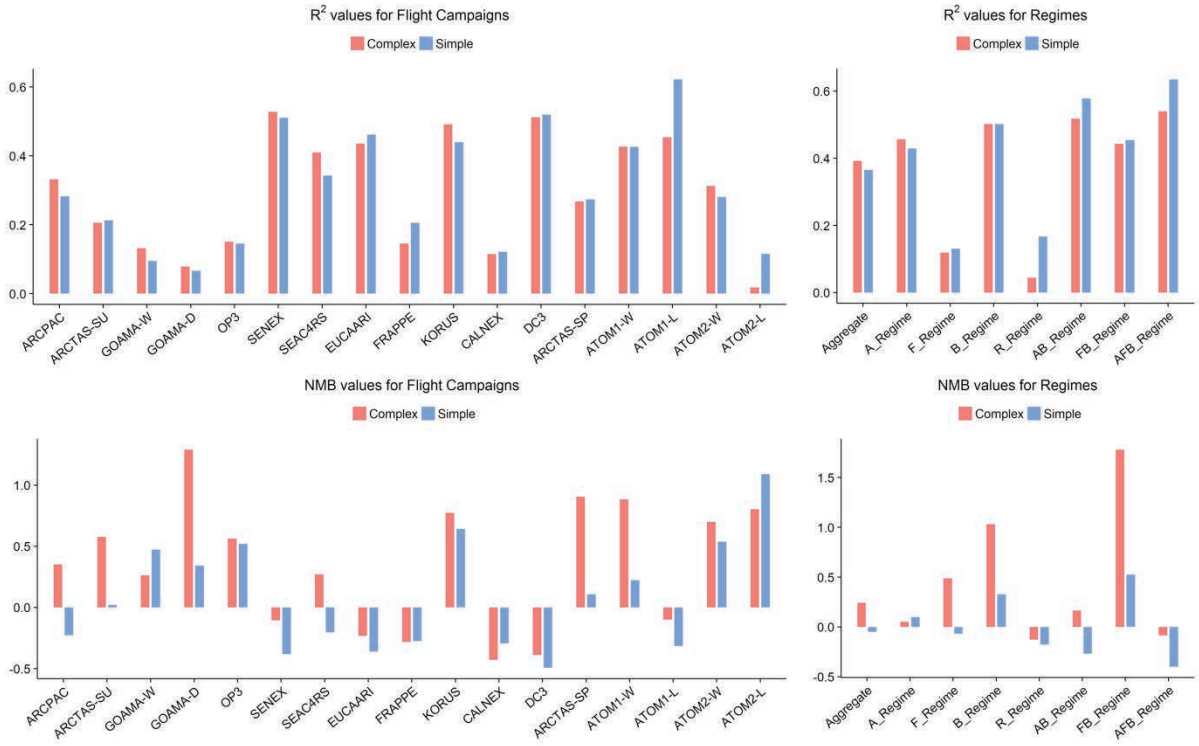

FIGURE 1. Preliminary results from the comparison of two model organic aerosol (OA) schemes with observed OA mass concentrations using the normalized mean bias (NMB) and coefficient of determination (R2) as evaluation metrics for a suite of aircraft campaigns and segmented regimes. The regimes are defined based on the relative dominance of OA from different sources – Anthropogenic, Fire, Biogenic and Remote. A positive normalized mean bias indicates that the model over predicts OA loadings.

The recipients of the Early Career Oral and Poster Presentation Competition were given a handmade award from a local Takamatsu artist, Ms. Rie Sugiyama. "Ajiishi" is a kind of Mikage stone from the Kawaga prefecture and is of the world's best quality. The pedestal is made of Ajiishi. The blue glass is made from the powder of the Ajiishi stone and expresses the beautiful "Setouchi blue" color. This award is designed with the image of "Atmosphere" and "Earth" according the theme of iCACGP-IGAC 2018.

Stefan Wolff

Early Career Poster Presentation Award

Session 3: Atmospheric Chemistry & Ecosystems

2018 joint 14th iCACGP Quadrennial Symposium/ 15th IGAC Science Conference

Stefan Wolff is from Germany and earned his intermediate Diploma in Physics at the Technical University Clausthal and a Diploma in Meteorology at the Leibniz University of Hannover. Currently, Stefan is the representative for the Max Planck Institute for Chemistry at the National Institute for Amazonian Research (INPA), Manaus and Postdoctoral researcher at Max Planck Institute for Chemie, Mainz in Manaus, Brazil. His research focuses on profiles and fluxes of (reactive) trace gases: O_3, NOx, CO_2, H_2O.

What got you involved in this area of research and is there an element or aspect of your research you believe to be particularly important?

The importance of the Amazon rainforest in many aspects on local, regional and global scale; its role on the delivery of humidity and rain for the South American continent, carbon storage, the effects of deforestation and biomass burning and the role of emissions and depositions of gases to the forest.

Pursuing or earning a doctorate degree in the field of atmospheric chemistry is not an easy task. What challenges have you had to overcome to get to where you are now?

The adventures and challenges in building up high-resolution measurements in the middle of the tropical Amazon rainforest, working with complex logistical issues and to guarantee the good quality of long-term measurements and analyses.

How do you want your career to progress and where do you think you can ultimately have the greatest impact?

Continuing to work in networks, creating new ideas together also focusing on the communication of science and scientific results; helping to build up broader and connected science in the Amazon region, working in the field between science, society and politics.

What was the most interesting thing you learned and who was the most interesting person you met during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference?

It´s hard to choose the "most interesting thing" of such a great conference like iCACGP-IGAC 2018. I got motivated and inspired by many conversations, talks and presentations I have seen. One point, which I would like to mention, is the outlook of Guy Brasseur on atmospheric science and the connections to society for the next 10-15 years, which I consider important to think about and to have in mind. I loved meeting many participants of our Latin American "LAECESS" network, and working together with them on promising ideas to get our ECS community stronger connected, further growing and supporting each other in a great way.

3.143 Ozone deposition at a rainforest site (ATTO) in the central Amazon Basin.

Presenting Author

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Abstract

Several recent papers have highlighted the importance of ozone (O_3) dry deposition estimates for modelling global O_3, especially over tropical forests. O_3 levels are expected to increase with ongoing deforestation: first, through release of O_3 precursors (NO_x) from biomass burning and secondly by reduced deposition as forest canopies (esp. tropical forest) efficiently remove O_3.

The ATTO (Amazon Tall Tower Observatory) site is located in the Central Amazon (02°08'38.8''S, 58°59'59.5''W), comprising a 325 meter and two 80 meter towers. The site is an ideal location to perform comprehensive long-term studies regarding forest-atmosphere interactions. The climate is characterized by a very rainy (350 mm in March) and a drier season (ca. 80 mm in September). During the wet season, the air quality shows almost pristine conditions, whereas strong pollution from regional scale biomass burning prevails in the drier season. Since 2012 vertical mixing ratio profiles of H_2O, CO_2 and O_3 have been continuously measured at multiple heights between 0.05 and meanwhile 325 meters. Ozone fluxes have been determined by means of gradient methods and eddy covariance.

Here we present O_3 deposition velocities from gradient and eddy covariance measurements with first results of a recent O_3 flux campaign aimed at disentangling the different O_3 deposition pathways. Fluxes were measured at two levels above and two levels within the canopy to address a) the chemical flux divergence above canopy, b) the total ecosystem flux and c) the partitioning of the flux between upper canopy and understory and soil fluxes. Based on parallel profile measurements of O_3 and NOx the storage flux of O_3 and the loss by reaction of O_3 with NO will be calculated. The fluxes for the different canopy parts are analyzed by means of stomatal and non-stomatal fluxes based on estimates of stomatal conductance from water vapor fluxes and leaf-level measurements.

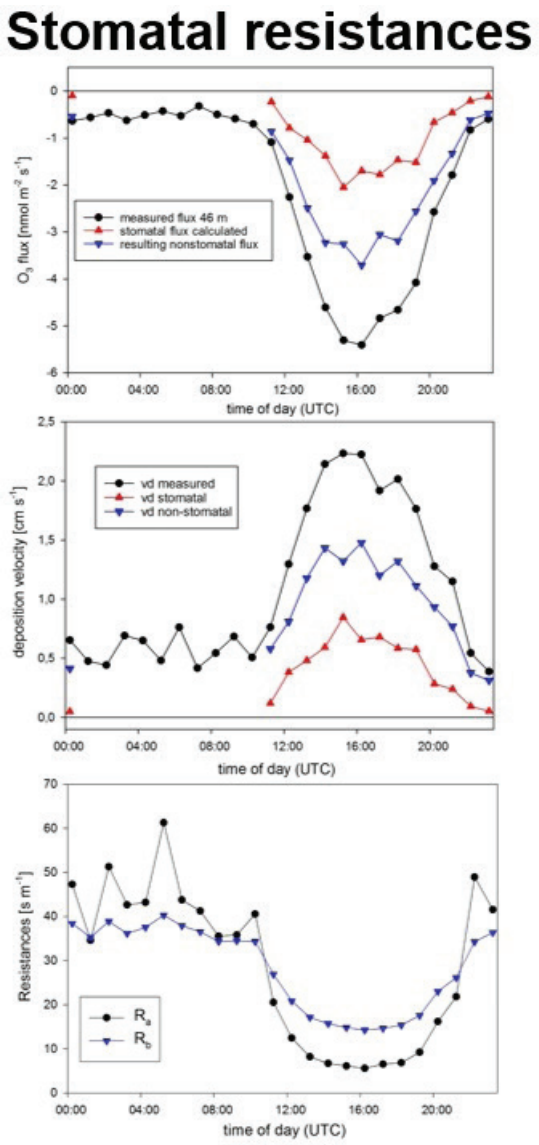

FIGURE 1: Mean diurnal fluxes of O_3 (top) showing measured fluxes and the portioning between stomatal and non-stomata fluxes. O_3 deposition velocity (middle), and stomatal resistances (bottom) between March and May at the 81 m walk up tower at ATTO.

Megan Willis

Early Career Poster Presentation Award

Session 4: Atmospheric Chemistry & Climate/Weather

14th Quadrennial Symposium iCACGP 15th Science Conference IGAC 2018 TAKAMATSU KAGAWA JAPAN

2018 joint 14th iCACGP Quadrennial Symposium/ 15th IGAC Science Conference

Megan Willis grew up in Nanaimo, British Columbia on Vancouver Island. She received her undergraduate degree in chemistry and math at Vancouver Island University (VIU), and her PhD in chemistry from the University of Toronto. Megan is currently an NSERC post-doctoral fellow at Lawrence Berkeley National Lab, in Berkeley, California where she moved from the field into the lab for her post-doc and is studying heterogeneous chemistry of aerosol in the Wilson group using droplet trapping techniques coupled to mass spectrometry.

What got you involved in this area of research and is there an element or aspect of your research you believe to be particularly important?

Several excellent teachers, in high school and university, motivated my original interest in environmental science. At VIU I learned fundamental concepts in physical and analytical chemistry in the context of environmental chemistry, and this really cemented my excitement about science and its relevance to my everyday life. I was drawn to atmospheric chemistry because of its applicability to current environmental issues; air quality and global climate change. My PhD experience has motivated me to pursue a career in atmospheric chemistry because it has taught me the global importance of atmospheric chemistry, and has exposed me to the interdisciplinary nature of our field.

Pursuing or earning a doctorate degree in the field of atmospheric chemistry is not an easy task. What challenges have you had to overcome to get to where you are now?

While I've faced many challenges during my doctoral work, I've always learned something about science, about myself and about working with others through these experiences. Field work in remote locations has definitely been both one of the biggest challenges of my PhD and one of the highlights. Fortunately, a really supportive field team has gotten me through the many challenges that arise in the field.

How do you want your career to progress and where do you think you can ultimately have the greatest impact?

I am most excited about the connections between in-situ observations we make of the atmosphere and our understanding of fundamental chemical processes. Following this interest, I will continue in a research focused career bridging laboratory and field investigations in atmospheric chemistry. I believe I can have the largest impact on our field by sharing my knowledge and enthusiasm for science with others, especially with younger scientists.

What was the most interesting thing you learned and who was the most interesting person you met during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference?

I find it a bit difficult to select one out of the many interesting talks and posters at iCACGP-IGAC 2018, but I was particularly excited to hear about new results from the Atmospheric Tomography Mission (ATom). ATom observations are expanding our knowledge of new particle formation in the free troposphere on a global scale, and on marine sulfur chemistry. These data are so exciting to see! The most interesting people I met at the conference were the 39 other early career scientists who attended the Early Career Short Course. I learned so much from this diverse group, and I only wish we had more time to spend together.

4.024 Sources and Removal of Springtime Arctic Aerosol.

Presenting Author

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Andreas Herber, Alfred Wegener Institute for Polar and Marine Research, Bremen, Germany

Richard Leaitch, Environment and Climate Change Canada, Toronto, Ontario, Canada

Jon Abbatt, Department of Chemistry, University of Toronto, Toronto, Ontario, Canada

Abstract

The sources, chemical transformations and removal mechanisms of pollution transported to Arctic regions are key factors in controlling the impact of short-lived climate forcing agents on Arctic climate, but insufficient knowledge of these factors limits our predictive capability. We present vertically resolved observations of aerosol physical and chemical properties in High Arctic springtime. While much previous work has focused on characterizing episodic events of high pollutant concentrations transported to Arctic regions, here we focus on measurements made under conditions consistent with chronic Arctic Haze, which is more representative of the pollution seasonal maximum observed at long term monitoring stations and possibly more indicative of the High Arctic troposphere in general. On six flights based at Alert and Eureka, Nunavut, Canada (largely north of 80°N), we observe evidence for systematic vertical changes in both aerosol sources and removal mechanisms. With support from model calculations using FLEXPART-ECMWF, we show evidence for sources of partially neutralized aerosol with higher organic aerosol (OA) and black carbon content in the middle troposphere,

compared to lower tropospheric aerosol with higher amounts of acidic sulfate. Our observations suggest that surface-based long term monitoring has underestimated the contribution of OA to aerosol transported to the High Arctic troposphere. Further, we show evidence for aerosol depletion relative to carbon monoxide, both in the mid-to-upper troposphere and within the Arctic Boundary Layer (ABL). Dry deposition, with relatively low removal efficiency, may be responsible for aerosol removal in the ABL while ice or liquid-phase scavenging was likely responsible for aerosol removal at higher altitudes during transport. Overall, we find that the vertical dependence of both regional and remote aerosol sources, and removal mechanisms, combine with long aerosol residence times to drive the properties of springtime Arctic aerosol.

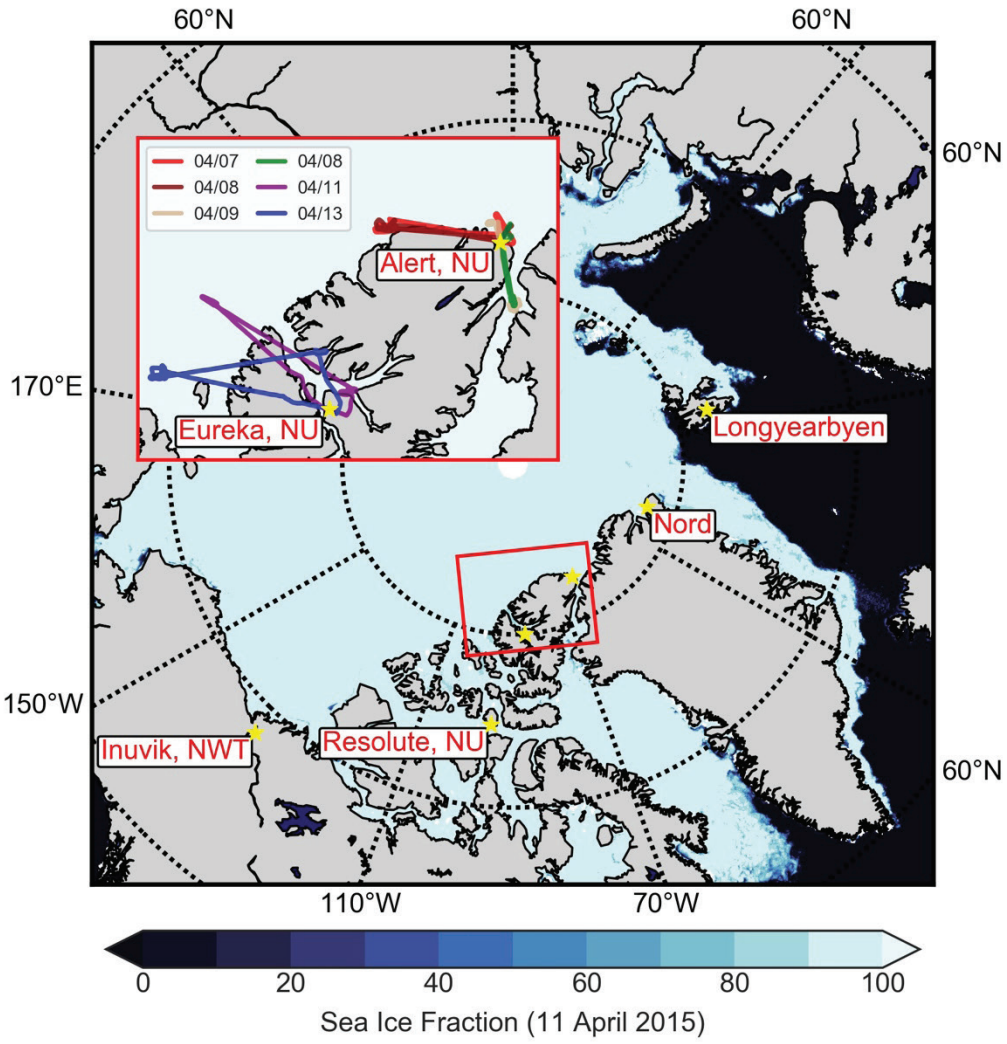

FIGURE 1. Map showing High Arctic field locations and flight tracks during the NETCARE 2015 aircraft campaign.

Xuesong Zhang

Early Career Poster Presentation Award

Session 5: Challenging the Future

2018 joint 14th iCACGP Quadrennial Symposium/
15th IGAC Science Conference

Xuesong Zhang is from Harbin, Heilongjiang, China, a city in northeastern China. He received his undergraduate and masters in physics from the University of Toronto, Canada. Currently, Xuesong is a PhD student at the University of Toronto studying multi-species chemical data assimilation on quantifying tropospheric CO, NO_2, O_3, and OH.

What got you involved in this area of research and is there an element or aspect of your research you believe to be particularly important?

Before I went to University, I was aware of air pollution and global warming existing on the planet. The air quality issue in the first five years of 2010s was quite severe in my hometown. That led me to learn more about the atmosphere, as well as physical and chemical modelling. My participation in a NCAR undergraduate Leadership workshop in 2011 gave me an opportunity to share the vision with other young scientists at the time, which convinced me that studying atmospheric physics and chemistry using models could be my research project. I have been doing my Ph.D. research on chemical data assimilation with Prof. Dylan Jones, who has been providing key insights on data assimilation and atmospheric chemistry and helps me solving the cutting-edge problems.

Pursuing or earning a doctorate degree in the field of atmospheric chemistry is not an easy task. What challenges have you had to overcome to get to where you are now?

Researching on chemical data assimilation involves knowledge from multi-disciplinary subjects, not limited to physics, chemistry, bio-terrestrial modeling, and computer science. The background knowledge that builds up to a solid understanding in problems related to atmospheric physics and chemistry usually can be overwhelming, which would require time and patience in your everyday approach. Since the multi-species data assimilation also requires high computational cost, the project itself has a high challenge involving critical thinking on proposing scientific robust and yet efficient methodologies.

How do you want your career to progress and where do you think you can ultimately have the greatest impact?

In the future, I would like to continue the multi-species or multi-factor data assimilation projects. Instead of proposing any

job position anywhere, I look at myself having the greatest impact helping the general public (including my family members, friends and future colleagues) to understand the basic notion of air pollution, global warming, as well as key concepts of my research project.

What was the most interesting thing you learned and who was the most interesting person you met during the 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference?

I enjoyed the early career special talk by Prof Yuan Tseh Lee. It is very interesting to see the origin of elementary chemistry dynamics. But more importantly, Prof Lee shared his view on how to make an impact from a scientist point of view on the society as well as on younger generations.

During the conference, I had many conversations with Dr. Kazuyuki Miyazaki from JAMSTEC. Since he also works in the field of multi-species chemical data assimilation, we shared a lot of insight on details of our study. Dr. Miyazaki also introduced me to other colleagues in the inverse modelling community who are working on CO and NOx emission estimates. We are planning to do an intercomparison project on O_3 data assimilation which compares LETKF with 4D-var data assimilation scheme.

5.086 Global CO emissions inferred from assimilation of MOPITT, together with observations of O_3, NO_2, HNO_3, and HCHO.

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Abstract

Atmospheric carbon monoxide (CO) emissions estimated from inverse modeling analyses exhibit large uncertainties, due, in part, to discrepancies in the tropospheric chemistry in atmospheric models. We attempt to reduce the uncertainties in CO emission estimates by constraining the modeled abundance of ozone (O_3), nitrogen dioxide (NO_2), nitric acid (HNO_3), and formaldehyde (HCHO), which are constituents that play a key role in tropospheric chemistry. Using an updated GEOS-Chem four-dimensional variational (4D-Var) data assimilation system, we estimate CO emissions by assimilating observations of CO from the Measurement of Pollution In the Troposphere (MOPITT), together with

observations of O_3 from the Optical Spectrograph and InfraRed Imager System (OSIRIS) and the Infrared Atmospheric Sounding Interferometer (IASI), NO_2 and HCHO from the Ozone Monitoring Instrument (OMI), and HNO_3 from the Microwave Limb Sounder (MLS). Although our focus is on quantifying CO emission estimates, we also infer surface emissions of nitrogen oxides (NOx = NO + NO_2) and isoprene. Our results reveal that this Multiple Species chemical data Assimilation (MSA) produces consistent chemical states that effectively adjust the CO-O_3-OH coupling in the model, which shows the potential of using MSA to produce realistic chemical reanalysis in the future. The inferred CO emission estimates from major anthropogenic, biomass burning and biogenic sources are discussed. The modeled CO is improved by 10-35% over the northern hemisphere through the assimilation.

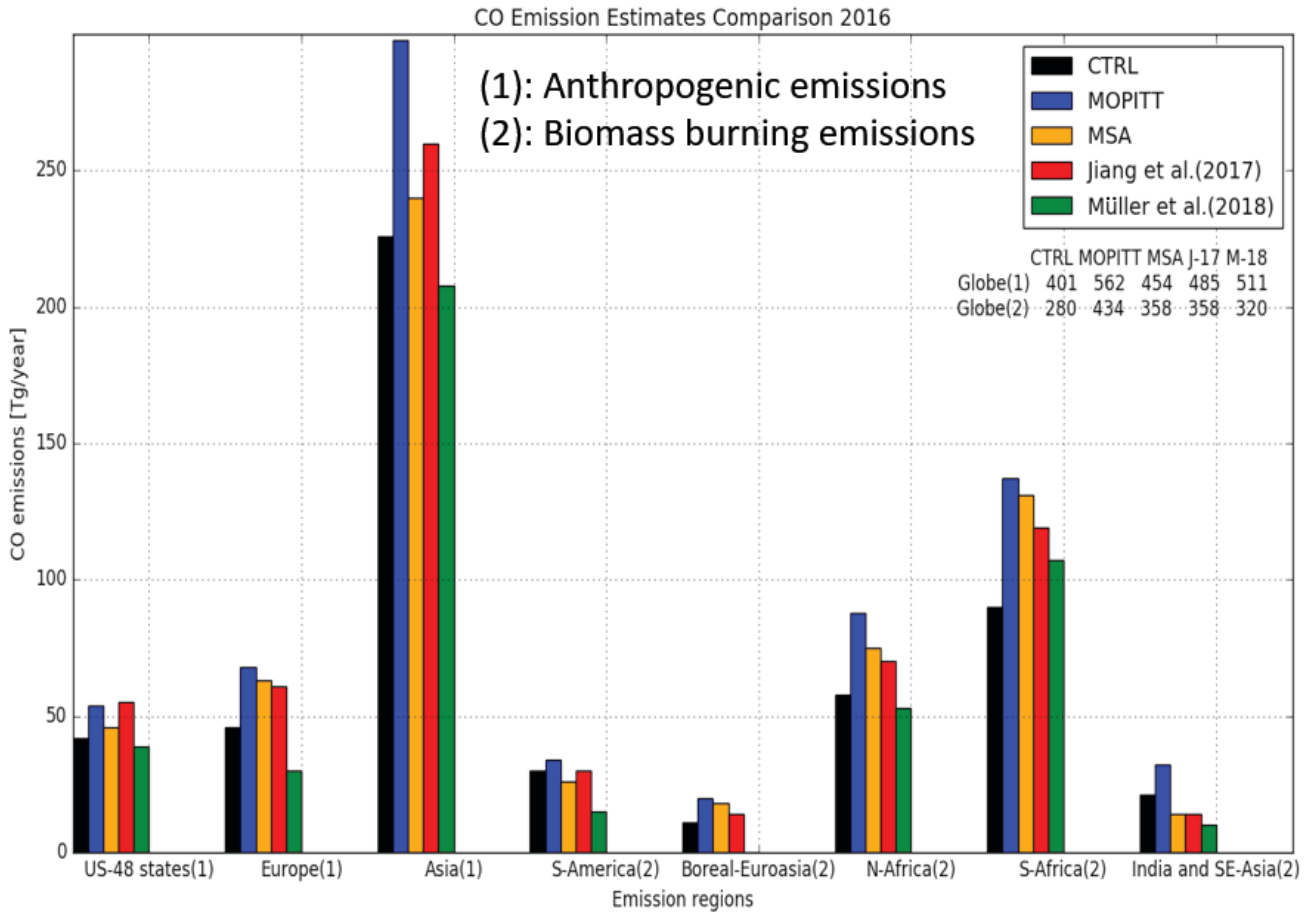

FIGURE 1. CO emission estimates for 2016 from CTRL run (GEOS-Chem forward model run only), MOPITT CO assimilation, and Multi-Species data Assimilation (MSA), with comparisons of CO posterior emissions estimated by Jiang et al. (2017) and by Müller et al. (2018). The regional emissions are shown in bars, and the global emissions are shown on the top right in numbers (in Tg/year). Type (1) refers to anthropogenic sources, Type (2) refers to biomass burning sources.

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