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IGACnews

facilitating atmospheric chemistry research towards a sustainable world

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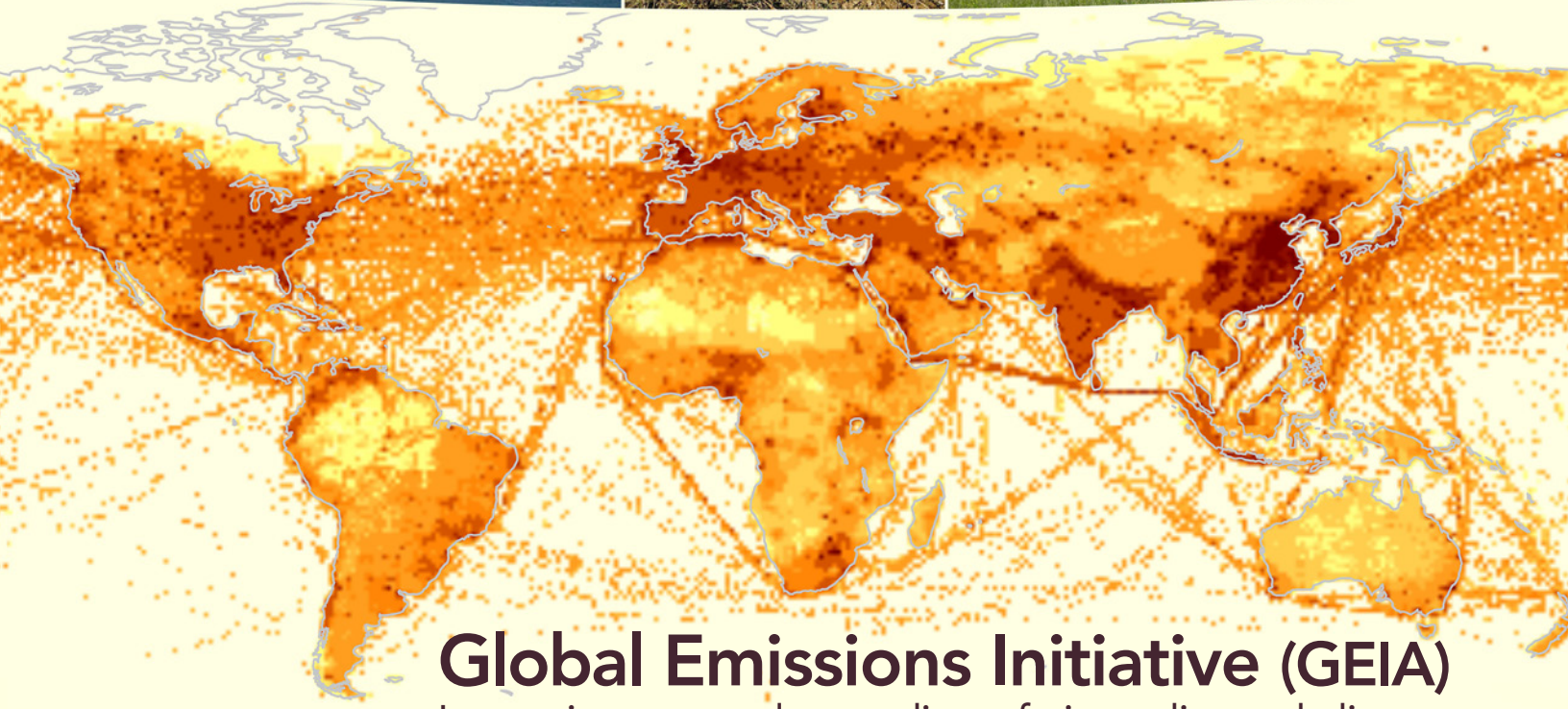

Global Emissions Initiative (GEIA)

Improving our understanding of air quality and climate

» workshop summary, pg. 12

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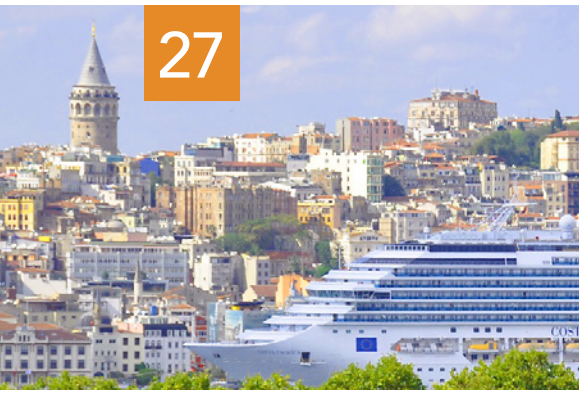

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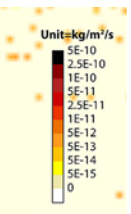


On the Cover

Emissions of Nitrogen Oxides from Anthropogenic Activities in 2010. The MACCity inventory quantifies trace gases and aerosols emitted by a variety of human activities, including energy production, industry, transportation and agriculture. Data and image provided by Claire Granier and Gregory Frost.

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.

editor's note

Happy New Year to the IGAC Community!

2016 is going to be a very exciting year for IGAC.

In December, many members of the IGAC Community attended the IGBP Landmark Synthesis Event at the American Geophysical Union (AGU) Fall Meeting in San Francisco, CA, USA. The event provided a way to celebrate three-decades of IGBP's scientific and institutional legacy and hand over the baton of global-change research to **Future Earth**. IGAC is very grateful for the support IGBP provided to IGAC over the past 26 years.

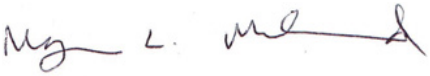
With the end of IGBP, IGAC will transition to a core project of Future Earth in 2016 and will continue to be sponsored by the international Commission for Atmospheric Chemistry and Global Pollution (**iCACGP**). IGAC believes the global platform of Future Earth will provide unique and new opportunities for IGAC to collaborate with a wider international global change and sustainability community. In fact, this is already occurring through Future Earth Knowledge Action Networks, the development of the Future Earth Open Network, and numerous events. The IGAC community plays a pivotal role in Future Earth and I encourage you to stay up-to-date on Future Earth by subscribing to the Future Earth newsletter (subscribe **here**).

In addition to the transition to Future Earth in 2016, IGAC is holding its 14th biennial science conference the 26th – 30th of September 2016 in Breckenridge, CO, USA (**igac2016.org**). The Local Organizing Committee, chaired by Christine Wiedinmyer (NCAR), has chosen a venue that will provide a great space for the IGAC community to network, share science, and plan future collaborations. The Scientific Program Committee, co-chaired by Hiroshi Tanimoto (NIES, Japan) and Claire Granier (LATMOS, France and NOAA/CU, USA), has put together a great program with 6 excellent scientific sessions, three keynote speakers, and 12 invited speakers. Abstract submissions are now open and I encourage you to submit an abstract by the 02 April 2016 deadline.

Finally, another exciting aspect to 2016 is IGAC will have its first **Early Career Short Course** the weekend prior to the 2016 IGAC Science Conference. The early career organizing committee, co-chaired by Steven Brey (CSU, USA) and Sarah Monks (NOAA/CU, USA), is designing an excellent agenda for the short course in addition to early career events throughout the IGAC Science Conference. The short course is limited to 35 early career scientists and applications are due 15 April 2016. The early career program during the conference will be open to ALL early career scientists attending the conference.

I hope to see you in September in Breckenridge, CO, USA!

Happy reading!



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.

IGAC Welcomes Two New Members to its SSC

At the end 2015, three members of the IGAC Scientific Steering Committee completed their service. IGAC is very grateful for the years Shih-Chun Candice Lung from Academia Sinica in Taiwan, Mary Barth from NCAR in the USA, and Chhemendra Sharma from NPL in India served on the SSC. They will be greatly missed.

At the start of 2016, the IGAC SSC welcomed two new members, Jennifer Murphy of the University of Toronto in Canada and Manish Naja of ARIES in India.

Jennifer Murphy
University of Toronto

Jennifer Murphy is an Associate Professor in the Department of Chemistry at the University of Toronto, where she has held a Canada Research Chair since 2007. Her doctoral studies at the University of California, Berkeley (2000-2005) focused on measurements and analyses of nitrogen oxides and ozone. As a postdoctoral fellow at the University of East Anglia (2005-2006), she made measurements of volatile organic compounds from the British research aircraft during the AMMA campaign in West Africa. Her current research program focuses on the atmospheric chemistry and biogeochemistry of reactive nitrogen species, including nitrogen oxides, nitrous acid, ammonia, and amines. Her group has carried out fieldwork in California, Colorado, Utah, Michigan, Ontario, the Alberta Oil Sands Region, and the Canadian High Arctic. Jennifer is an Editorial Board member of the journals *Atmospheric Chemistry and Physics* and *Geochemistry Journal*, and a council member of the Royal Canadian Institute for the Advancement of Science.

Manish Naja
ARIES, Nainital

Manish Naja is a senior scientist and vice-chair of Solar Physics and Atmospheric Science group at ARIES, Nainital. He pursued his doctoral research work at PRL, Ahmedabad and has worked as a postdoctoral scientist at FRCGC, JAMSTEC, Yokohama and NIES, Tsukuba, before joining ARIES. His major research interest has been in the observations of the trace gases using surface based, ship-borne and balloon-borne instruments. He has been involved in INDOEX (Indian Ocean Experiment), GOSAT (Greenhouse Gases Observing SATellite), GVAX (Ganges Valley Aerosol Experiment) programs. Now, he is actively involved in studying the influence of long-range transport, regional air-pollution and air quality over South Asia utilizing regional and box models and satellite data. He is the PI of ISRO's (Indian Space Research Organization) AT-CTM (Atmospheric Trace gases Chemistry Transport and Modeling) and ARFI (Aerosol Radiative Forcing over India) projects at ARIES. A wind profiler (Stratosphere-Troposphere Radar) is also coming-up at ARIES and he is leading this facility. He is also heading the academic committee at ARIES, which is responsible for the PhD program at the Institute.

2016 IGAC Science Conference

Abstract Submissions Now Open!!!

26-30 September 2016

The 2016 IGAC Science Conference is a high profile event that will attract approximately 600 top international scientists, industry leaders, policy makers and early career scientists from around the world. The scientific program includes six exciting sessions on atmospheric chemistry and urbanization, agriculture and ecosystems, energy, fundamental studies, climate change, and observing composition and variability. Please visit **igac2016.org** for more information.

Abstract submission deadline is 2 April 2016!

IGAC Announces the 1st IGAC Early Career Short Course

In order to develop a stronger early career program, IGAC will hold its first early career short course in 2016. The weekend prior to the 2016 IGAC Science Conference, 35 selected early career scientists from around the world will come together for a three-day intensive short course. The short course will provide an opportunity for these selected early career scientists to learn career skills and to build a network amongst their peers. Please visit **igacearlycareershortcourse.org** for more information.

Application deadline is 15 April 2016!

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 June/July issue of the IGACnew is 10 June 2016. Send all submissions to **info@igacproject.org**.

Introducing IGAC EASS

IGAC is pleased to announce the launch of the Event Abstract Submission System (IGAC EASS). This system aims to make submitting abstracts to IGAC Events a friendlier and seamless process. In order to submit abstracts to IGAC Events, you will first have to create a profile in the system. When you create a profile you can also choice to sign up for IGAC Activity and IGAC Working Group email lists. In the near future, as part of EASS, IGAC will also give you the option to enter more information regarding your research interests and select to allow other IGAC community members that are part of EASS to search your profile to help facilitate collaborations. Please visit **igacproject.org/EASS** for more information.

Please Note:
Abstract submissions for the 2016 IGAC Science Conference is through IGAC EASS.

30th Annual IGAC SSC Meeting

29 SEPT – 1 OCT 2016
POTSDAM, GERMANY

IGAC Sponsored

AUTHOR

Mark Lawrence, Institute for Advanced Sustainability Studies, Germany

Allen Goldstein, University of California - Berkeley, USA

HOST INSTITUTION AND FUNDING

FUNDING

PARTICIPANTS

Brazil, Canada, China, France, Germany, India, Japan, Mexico, South Africa, Taiwan, Thailand, United Kingdom, United States, Sweden, Switzerland.

BACKGROUND

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

IASS, Potsdam, Germany

Twenty two IGAC Scientific Steering Committee (SSC) members and liaisons from other organizations gathered to discuss the ongoing activities, recent successes, and future plans of the highly-active international IGAC community. In order to further support, engage and connect our community, the SSC worked on advancing the "branding" of IGAC, including: simplifying IGAC's Mission to "Facilitating atmospheric chemistry research toward a sustainable world"; describing its work in three main categories – "Fostering Community", "Building Capacity", and "Providing Leadership"; improving its "virtual presence" through a new logo, an updated website, an improved member database system, and an increased presence on social media.

Activities are a core aspect of IGAC (see **igacproject.org/Activities**). Recent efforts in all of IGACs Activities were discussed in a very vibrant World Café session, resulting in a range of recommendations, including:

- Seeding initiation of new Activities addressing specific scientific opportunities in Atmospheric Chemistry.
- Focusing on tangible outcomes including publications, special issues, data products, conference sessions and workshops, and contributions to the IGACnews.
- Enhancing Capacity Building and inclusiveness by encouraging the participation of a wide community.
- Promoting active exchange of information among different IGAC Activities.
- Proactively collaborating with other international organizations (e.g., WMO, SPARC, HTAP, SOLAS, iLEAPS etc.).

In addition to its core Activities, IGAC supports several national/regional working groups. The established China and Americas Working Groups, as well as the Japan National Committee, reported on their ongoing work. Progress in development of the Monsoon Asia and Oceania Networking Group (MANGO) was discussed, including reports on two workshops held in Bangkok earlier in 2015. Finally, early efforts towards creating an Africa Working Group were discussed. IGAC's SSC generally encouraged all working groups to seek funding for early career scientists to attend the IGAC Science Conferences and workshops, as well as to strive towards providing a thorough overview of the breadth of atmospheric chemistry research going on in their respective regions and, together with the IGAC International Project Office, disseminate this information to the broader IGAC community.

The SSC had very fruitful discussions with liaisons from our sponsors, namely iCACGP, IGBP, and Future Earth, and our collaborators, including SPARC, iLEAPS, SOLAS, and WMO. Finally, we took a look to the future, considering in detail the transition of IGAC to Future Earth. While we will miss the very supportive and fruitful interaction with IGBP over the last 26 years, we see Future Earth as a genuine opportunity for the international atmospheric chemistry community to enhance connections between strong laboratory, field and modeling studies on emissions, atmospheric processes and atmospheric composition and the larger Earth system research community. Through Future Earth, IGAC can promote international collaborations and co-design the scientific knowledge required to respond effectively to the challenges and opportunities of global environmental change and sustainability.

The transition to Future Earth will not only provide opportunities, but also challenges that accompany interdisciplinary and transdisciplinary interactions in the context of global sustainability issues. Taking advantage of the venue at the IASS, the SSC addressed this issue in a half-day mini-workshop that was held together with the IASS prior to the SSC meeting. The workshop was titled "Doing good atmospheric chemistry research in an interdisciplinary and transdisciplinary environment". Several plenary presentations were given by co-workers of IASS about topics ranging from the challenges and rewards of doing PhD projects in an interdisciplinary and transdisciplinary group, to careers combining science and policy, and an interdisciplinary panel discussion highlighted the topic of barriers in interactions between researchers of various disciplines. The SSC concluded that further such mini-workshops together with the host institution would be welcome, when they can highlight issues of interest to the broader IGAC SSC.

Meeting Participants

The meeting closed with a discussion of the exciting plans for the 2016 IGAC Conference in Breckenridge, Colorado USA 26-30 September 2016, as well as initial considerations for program, timing, and location of the 2018 joint iCACGP Symposium/IGAC Science Conference. We look forward to welcoming many of you there as we come together again to share the latest and greatest in the field of Atmospheric Chemistry.

Fourth Chemistry-Climate Model Initiative (CCMI) Workshop

7-9 OCTOBER 2015
FRASCATI (ROME), ITALY

IGAC Sponsored

AUTHORS
Jean-François Lamarque, NCAR, USA

Michaela Hegglin,
University of Reading, UK

HOST INSTITUTIONS:
ESA (OCT. 7) and ISAC-CNR (OCT. 8 and 9)

FUNDING

PARTICIPANTS
Australia, Canada, Chile, Czech Republic, France, Germany, India, Israel, Italy, Japan, Nepal, New Zealand, Nigeria, Norway, Poland, Spain, Switzerland, The Netherlands, UK, USA.

BACKGROUND

IGAC financially sponsored this workshop to support the jointly sponsored IGAC/SPARC Chemistry-Climate Model Initiative (CCMI) activity. This activity was established to coordinate future (and to some extent existing) IGAC and SPARC chemistry-climate model evaluation and associated modeling activities.

Frascati, Italy

One hundred and thirty scientists representing 20 countries recently gathered in Frascati (Rome), Italy for the Fourth Chemistry-Climate Model Initiative Workshop. The workshop spanned 3 days: the first day (October 7) was joint with **AeroCom** with the main purpose of discussing the CCMI/AeroCom proposal to the WCRP Climate Model Intercomparison Project Phase 6 (CMIP6), AerChemMIP. This session was held at the European Space Agency (ESA). The following two days (October 8 and 9), held at CNR, focused on CCMI activities. Closed Scientific Steering Committee sessions were held on the evenings of October 6 and 9.

Joint session (October 7)

The AerChemMIP proposal, which was jointly designed by AeroCom and CCMI and officially approved by the CMIP panel in August 2015, was presented. It aims to address the question of how different climate forcers have affected climate in the past by focusing on the quantification of the effective radiative forcing of near-term climate forcers (NTCFs), ozone depleting substances (ODSs), and well-mixed greenhouse gases. AerChemMIP will also investigate how future policies on climate, air quality, and land use will affect NTCFs and their climate impacts. CCMI, through its work on process-oriented model evaluation, will provide a crucial basis for the interpretation of model differences found within AerChemMIP. Additional CMIP6 proposals (RFMIP, VolcMIP) along with relevant datasets (e.g. emissions, ozone) were also discussed.

Workshop Participants (Joint session with AeroCom)

CCMI session (October 8 and 9)

This session was organized around 5 themes: 1) Assessment Reports (TOAR and WMO), 2) Modeling Advances, 3) Tropospheric Chemistry, Dynamics and Transport, 4) Observations and 5) Stratosphere and Stratosphere-Troposphere Coupling. For each theme (see full agenda **here**) invited and submitted contributions were presented. In addition, a very extensive poster session (with more than 100 posters!) provided an exciting overview of the various CCMI activities. The last part of the meeting was dedicated to three breakout groups (matching current interests of the CCMI community) on: (1) Specified Dynamics (nudged simulations and transport), (2) Stratosphere-Troposphere Dynamical and Chemical Coupling, and (3) Chemical and Dynamical Controls of Tropospheric Ozone and OH.

Next steps

The CCMI Scientific Steering Committee (SSC) revisited the timeline and future development of CCMI based on discussions held during the workshop. It was decided to hold the next CCMI workshop spring 2017, with Météo-France kindly offering to host the meeting in Toulouse, France. In the meantime, CCMI encourages participation from the CCMI community in the 2016 IGAC Science Conference, which will be held from 26-30 September in Breckenridge, Colorado, USA. The timing of the CCMI 2017 Science Workshop will allow for an intensive period of evaluation of the CCMI-1 simulations during 2016 as well as to work towards publications that will contribute to CCMI-related science questions and in particular to the 2018 WMO/UNEP ozone assessment report. Therefore, a special issue entitled "Chemistry–Climate Model Initiative (CCMI)" between the online journals ACP/AMT/GMD/ESSD has been set up, and is now ready to accept submission of CCMI-related publications. In addition, upcoming quarterly emails (through the CCMI email list; to join, email **m.i.hegglin@reading.ac.uk**) are planned and will provide CCMI major news, achievements, problems, and future plans.

PACES Arctic Air Pollution Workshop

29 SEPTEMBER - 1 OCTOBER 2015
HELSINKI, FINLAND

IGAC Sponsored

AUTHORS

Steve Arnold, University of Leeds, UK

Kathy Law, LATMOS, France

Chuck Brock, NOAA/ESRL/CSD, USA

HOST INSTITUTION

FINNISH METEOROLOGICAL INSTITUTE

FUNDING

GLOBAL IGBP CHANGE

IASC

NERC SCIENCE OF THE ENVIRONMENT

PARTICIPANTS

Canada, Denmark, Finland, France, Germany, Japan, Norway, Russia, Sweden, Switzerland, UK, USA.

BACKGROUND

PACES
air Pollution in the Arctic:
Climate Environment and Societies

IGAC sponsored this workshop to support the the new emerging IGAC Activity air Pollution in the Arctic: Climate, Environment and Societies (PACES). This activity is being established to coordinate international research on Arctic air pollution and its impacts.

Workshop Participants

The PACES workshop was hosted by FMI (Helsinki), and was held jointly with the UK BORNET project, the PEEX (Pan Eurasian Experiment) and the AMAP Expert Group on Black Carbon and Ozone. Over 40 participants attended the workshop, from 12 nations covering Europe, North America and Asia. The aim of the workshop was to develop specific PACES actions geared towards reducing uncertainties in our understanding of Arctic air pollution and its impacts, as well as to provide an update on related initiatives and on-going projects. A key theme of the workshop was to discuss opportunities for improving knowledge of processes controlling air pollution in the Siberian high latitudes, a region where in-situ observations are currently limited. To this end, several Russian colleagues were able to attend the meeting leading to fruitful discussions about tackling air pollution research issues in the Russian Arctic/Siberia, in particular with regard to opportunities and challenges related to new observational capabilities in the region. The 2-day discussion led to the identification of several key topics that will be taken forward as PACES Working Groups. These are seen as a first step towards a PACES Implementation Plan. Further topics will be discussed in future workshops.

Helsinki, Finland

The proposed Working Groups (WGs) include:

1. Improving model predictive capability for Arctic air pollution and climate WG. Discussions centered on targeting model uncertainties through a combination of Lagrangian field experiments, ground-based and satellite data analysis, possibly in the 2018-2020 timeframe (coordinated with YOPP). A potential focus would be on transport of Asian pollution to the Arctic, through recognition that many model biases in Arctic pollutant distributions result from uncertainties in processing en-route to the Arctic during uplift, long-range transport and loss processes. Initial work in this group will focus on evaluation of processes such as wet/dry deposition treatments in models, and identification of key processes to be targeted with new observations.

2. Collaborative Russian WG. This group will further explore possibilities for enhanced cooperation and improved measurement capabilities in Siberia. This will include logistics for sharing of standards/instrumentation, and personnel exchanges (students) related to research on air pollution sources in Siberia. This action is being developed in collaboration with the PEEX project and other related initiatives.

Several smaller actions were also discussed including, data mining, in particular in collaboration with the IASOA network of ground-based measurements, and building links with TF-HTAP on Arctic air pollution sources and impacts. The latter will be the subject of a specific workshop held in Potsdam on 17 February 2016. Discussions are underway for a planning meeting on PACES field activities to be held in summer/autumn 2016.

Other news:

PACES will be present at the Arctic Summit Science Week (ASSW) and Arctic Observing Summit (AOS) being held in Fairbanks, Alaska in March 2016. A Short Statement on PACES was submitted to the AOS which aims to build and enhance Arctic observing capabilities.

PACES will also host a small workshop on fostering collaborative research on Arctic air pollution between the natural and social-science communities.

Please contact one of the PACES co-chairs if you are interested in participating in PACES and would like to be added to the mailing list (**igacproject.org/PACES**).

18-20 NOVEMBER 2015
TSINGHUA UNIVERSITY, BEIJING, CHINA

IGAC Sponsored

17th GEIA Conference – *Influence of Urbanization on Emissions Worldwide*

AUTHORS

Gregory Frost, National Oceanic and Atmospheric Administration (NOAA), USA

Paulette Middleton, Panorama Pathways, USA

Leonor Tarrason, Norwegian Institute for Air Research (NILU), Norway

Qiang Zhang, Tsinghua University, China

Yuxuan Wang, Tsinghua University, China

HOST INSTITUTION

FUNDING

PARTICIPANTS

Austria, Azerbaijan, Bangladesh, Chile, China, Cuba, France, Germany, India, Italy, Japan, Korea, Mexico, Nepal, Netherlands, Norway, Pakistan, South Africa, Taiwan, Turkey, United Kingdom, United States.

BACKGROUND

IGAC financially sponsored this workshop to support the jointly sponsored IGAC/iLEAPS/AIMES Global Emissions Initiative (GEIA). This activity was established to provide emissions data and information to the scientific and stakeholder communities.

17th GEIA Conference Participants

One hundred and sixty scientists representing 22 countries and regions recently gathered at Tsinghua University in Beijing, China, for the 17th Conference of the Global Emissions InitiAtive (**GEIA**), which focused on the *Influence of Urbanization on Emissions Worldwide*. GEIA, a vibrant international scientific activity for 25 years, has three goals: 1) promoting broad and consistent access to global and regional emissions data; 2) improving the scientific basis of emissions information by enhancing analysis of emissions processes; and 3) strengthening the global community of emissions stakeholders.

The 3-day Conference included presentations organized around four themes: Megacities, Inventories & Trends, Top-Down Emissions Analyses, and Impacts & Scenarios. Several oral sessions on each theme combined short (5- or 10-min) talks on similar issues or regions, along with poster sessions that expanded and elaborated on each theme. Each oral session was followed by a question-&-answer panel of the speakers guided by a set of key questions, leading to extensive discussions that were a highlight of the Conference. A Town Hall breakout session allowed participants to discuss the interplay between emissions science and environmental policy, identifying pressing issues regionally and globally for which GEIA's active participation might help produce better emissions information and stronger science-policy connections. The Conference also provided a venue to demonstrate emerging capabilities for displaying and analyzing emissions data (**ECCAD**) and for building global emissions inventories (**CEDS**).

Beijing, China

The Conference highlighted the successes of the GEIA community and its Working Groups (WGs), while also demonstrating where progress is still needed. Since the 16th GEIA Conference in 2014, a number of new process-based "bottom-up" inventories are now available, particularly for rapidly developing parts of the world. The GEIA China WG has motivated many high quality emissions studies in China and is coordinating their work with other countries across East Asia. Similarly, GEIA's Latin America/Caribbean (LAC) WG is aggregating urban- and national-level information with the goal of working towards a LAC regional inventory. The Conference also showed that there is a need for additional information on local practices, underscoring differences between established inventories in developed regions and the evolving inventories in developing nations. Good examples of quantifying local practices were demonstrated with current work in Mexico, Nepal, India, and South Africa.

"Top-down" emissions efforts that use atmospheric observations and modeling have proliferated across the globe. The Conference demonstrated many examples of top-down evaluations of new and existing bottom-up inventories, and also how top-down approaches can lead to new inventory development. For example, GEIA's Volatile Organic Compound (VOC) WG is using observations from many areas across the globe to examine and improve the VOC speciation used in global and regional models. Similarly, the China and LAC WGs are exploiting top-down approaches to constrain inventories in their regions.

The Conference brought into focus some challenges for the GEIA community to tackle in the coming years. While there have been some successes constraining overall emissions in megacities with top-down estimates, there is still an urgent need for reliable and sustained source measurements in the world's urban areas. These observations can help quantify how various sectors contribute to the city's total emissions, demonstrate how environmental policies affect emissions, and aid in assessing the environmental implications of urban planning. Understanding these issues will be a primary focus of the nascent GEIA Urban WG.

Similarly, satellites offer exciting opportunities to examine some key pollutants with near-daily frequency across the globe. However, currently only a few emitted compounds can be reliably detected from space, satellites have low boundary-layer sensitivity for some of these compounds, and space-based observations are not direct measures of atmospheric abundance. Integration of satellite data with comprehensive aircraft campaigns, surface and tower observations, and atmospheric modeling is a critical task that many in the GEIA community will continue to investigate.

SEE
Thierno Doumbia
Early Career Scientist Profile
on p. 23

More information is needed on the chemical species produced from a variety of sectors worldwide. One key example is NH_3 emitted from agriculture, where process-level understanding and reliable observational approaches continue to evolve. These studies are critical to understanding the coupling between population growth, food supply, and their implications for the environment.

The Conference also showed the need for a consensus on how to quantify and report uncertainties in emissions datasets. Opportunities exist for GEIA members to aggregate information gathered from top-down studies and to assess the usefulness of emerging approaches, such as inverse and adjoint modeling, to inform and constrain emissions datasets.

More details of the Conference findings can be found in the presentations and other materials from the meeting, available at **geiacenter.org**.

The Conference demonstrated the similarities in the concerns and issues for developing the best emissions information around the world. In the years ahead, GEIA will continue its mission to improve emissions understanding in dealing with issues from megacity air pollution, regional and international air quality, and long-term climate change.

7-11 DECEMBER 2015
MEXICO CITY, MEXICO

IGAC Sponsored

Latin American Course on Remote Sensing applied to Atmospheric Chemistry

AUTHORS

Michel Grutter, Universidad Nacional Autónoma de México (UNAM), Mexico

Juan Carlos Antuña-Marrero, Instituto de Meteorología Camagüey, Cuba

Carlos Rudamas, Escuela de Física, Universidad de El Salvador, El Salvador

Rodrigo Jiménez, Universidad Nacional de Colombia, Bogotá, Colombia

HOST INSTITUTION AND FUNDING

FUNDING

PARTICIPANTS

Mexico, Colombia, Cuba, El Salvador, Argentina, Brazil, Bolivia, Uruguay, United States, Peru, United Kingdom, Chile.

BACKGROUND

Jointly sponsored by IGAC and UNAM, this course was an initiative from the IGAC Americas Working Group (AWG), which was formed in 2013 by several researchers from Latin American and Caribbean (LAC) countries to improve the collaborations in the region, connect the LAC community internationally and build capacity in research fields related to atmospheric chemistry.

Workshop Participants

A total of 44 participants (advanced undergraduate and PhD students as well as postdocs and researchers) and 11 lecturers representing 12 countries, attended a short course organized by members of the IGAC-AWG. The main goals of this one-week course were to provide LA researchers and early career scientists the theoretical concepts as well as practical training on optical remote sensing techniques for studying atmospheric composition. It was also aimed to learn about the results of research conducted by the different teams working in LA and to promote the organization of observational networks and collaborations in the region.

The lectures were given all in Spanish by eight experts from the LA region, one from Europe and two from the USA. General aspects of optical spectroscopy and the Differential Optical Absorption Spectroscopy (DOAS) technique were introduced by Carlos Rudamas, Erna Frins and Claudia Rivera, who also taught about different applications and gave some practical lessons for analyzing data. Martina Friedrich covered theoretical aspects of radiative transfer as well as inversion methods. Lectures about aerosols, light scattering and the concepts to measure the

PHOTO BY MARIO VILLAFÁN

Mexico City

optical depth from ground and space were covered by Omar Torres and Juan Carlos Antuña-Marrero. Gonzalo González talked about air-mass factor calculations and provided an in depth status of the current and future missions to measure gas pollutants from space. The theoretical and practical aspects involved in measuring atmospheric constituents with the Fourier Transform Infrared Spectroscopy (FTIR) technique, as well as a description of current satellite missions, were given my Michel Grutter and Wolfgang Stremme. Finally, an introduction of the LIDAR (Light Detection and Ranging) technique, common applications and some of the projects underway were taught by Pablo Ristori and J.C. Antuña-Marrero. They also described the goals of the LALINET (**Latin American Lidar Network**) and the results already achieved by the collaboration among LIDAR researchers.

There were an equal number of female and male students, who had the opportunity to present their current research in a poster session. The attendees visited the atmospheric observatory of Altzomoni, a contributing station to the *Network for the Detection of Atmospheric Composition Change* (NDACC). It belongs to the *University Network of Atmospheric Observatories of Mexico* (**RUOA**), run by UNAM, and is located at the Iztaccíhuatl-Popocatépetl National Park, at nearly 4,000 m of altitude. The studies that are being performed there include upper-atmospheric variability, pollution transport and emissions of a nearby active volcano. During the visit, the remote sensing techniques available on site were explained and demonstrated to the visitors.

The success of the course was evident from the rich interaction among all the participants and an enthusiastic and friendly environment felt throughout the week. This was confirmed by a survey with positive feedback and useful input for the next meetings. The course provided a unique opportunity for establishing connections among LA scientists using similar remote sensing techniques for atmospheric research, allowing the identification of common research interests; improving the existing communication and to plan future collaborations. Among the outcomes of the course it is to highlight the agreement to conduct further courses with higher level of specialization in the individual techniques.

Further details about the course, lecturers, program and some pictures can be consulted **here**.

21 OCTOBER 2015
TOKYO, JAPAN

IGAC Sponsored

IGAC Japan National Committee Annual Meeting

ORGANIZERS

Hiroshi Tanimoto, National Institute for Environmental Studies, Japan

HOST AND FUNDING

FUNDING

PARTICIPANTS

Japan

BACKGROUND

The IGAC Japan National Committee is a national committee under the Science Council of Japan. It oversees IGAC-related scientific activities in Japan and works closely with IGAC to contribute to the mission of IGAC.

Ritsurin Garden, Japan

Together with the international launch of the IGAC project, the atmospheric chemistry community in Japan was first organized in 1989. Since then, Japanese scientists have been continuously playing an important role in the development of atmospheric chemistry research, in particular in Asia, and in the implementation of the agenda of IGAC.

Under the Science Council of Japan (SCJ), the IGAC Japan National Committee plays a key role in the oversight of the IGAC-related activities in Japan, with specific goals to:

- Oversee the plans and progress of IGAC-oriented science projects and capacity building activities in Japan;
- Enhance the connection of Japanese scientists-led projects with IGAC;
- Encourage participation of Japanese scientists in IGAC activities;
- Provide support for raising funds to research plans proposed by Japanese scientists; and to
- Promote collaboration between IGAC-Japan scientists and other IGBP-Japan or WCRP-Japan communities (e.g., SOLAS, iLEAPS, SPARC, etc).

IGAC Japan National Committee Members

The current IGAC Japan National Committee comprises 26 members with expertise in gas kinetics, aerosol chemistry, satellite observations, emission inventory, global and regional modeling, bioaerosol, atmospheric deposition, greenhouse gases, and atmosphere-biosphere interactions.

The current IGAC Japan National Committee, promoted with the leadership of Hiroshi Tanimoto, a SSC member of IGAC, comprises 26 members with expertise in gas kinetics, aerosol chemistry, satellite observations, emission inventory, global and regional modeling, bioaerosol, atmospheric deposition, greenhouse gases, and atmosphere-biosphere interactions. The members of the committee rotate every 3 years among the members of the atmospheric chemistry research community in Japan. Although the Japan National Committee is independent of IGAC's National/Regional Working Group, we agreed to have more commitments to work with IGAC in order to strengthen the relationship between the Japanese atmospheric scientists and IGAC.

The working group holds its annual meeting every autumn. At the most recent meeting the members discussed the past and future development of atmospheric chemistry research, including coordination of existing activities and the launch of new activities at national and regional levels. We also discussed how to make a close linkage between Japan-led science projects and the science activities supported by IGAC.

A recent event supported by the Japan National Committee is "International Workshop on Heterogeneous Kinetics Related to Atmospheric Aerosols," jointly held with the China Working Group (led by Dr. Tong Zhu) in Beijing, China, on 9-10 August, 2015. The Japan National Committee has endorsed several proposals that have relevance for the development of atmospheric chemistry research in the world. These include "International Space Station (ISS) Earth Observatory Initiative (PI: Dr. Yasko Kasai)," which aims to achieve a 1 km-level spatial resolution in observing air pollutants in the lower troposphere, and two flying observation platforms, namely "New Research Aircraft for Atmospheric Science (PIs: Makoto Koike and Yutaka Kondo)" and "New Earth and Planetary Science using a Flying Boat (PI: Urumu Tsunogai)."

Collaboration with the KORUS-AQ campaign to be held in May-June 2016 was also discussed with great interest. In the future, the Japan National Committee will have closer links with IGAC MANGO, which is a new regional working group focusing on Asia under the IGAC. For more details, please visit our website at **igacproject.org/JapanNationalCommittee**.

DEBITS Repositioning Workshop

19 OCTOBER 2015
ROCHESTER, NY, USA

IGAC Endorsed

AUTHOR

Corinne Galy-Lascaux, Laboratoire d'Aérologie CNRS- Université Paul Sabatier, France

Kobus Pienaar, North West University, South Africa

HOST INSTITUTION

FUNDING

PARTICIPANTS

Canada, USA, Norway, Ivory Coast, Kenya, India, South Africa, Brazil, Switzerland, UK, France.

BACKGROUND

The Deposition of Biogeochemically Important Trace Species (DEBITS) has been sponsored by IGAC since its foundation in 1990. The objective of the workshop was to redesign and reposition the DEBITS activity to be solution-orientated and link deposition studies to environmental change and development challenges by embracing a more interdisciplinary collaboration approach. A new organizational structure as well as new collaboration agreements had to be established that are aligned with the new vision of IGAC within Future Earth.

DEBITS Workshop Participants

Nineteen (19) scientists representing eleven countries recently gathered in Rochester, NY, USA, for the DEBITS repositioning workshop. This DEBITS scientific meeting wad held before the **9th Acid Rain Conference** "Successes Achieved and the Challenges Ahead" on 19 October 2015.

DEBITS (Deposition of Biogeochemically Important Trace Species) was created in 1990 to serve as a "catalyst" to encourage and coordinate atmospheric deposition studies in tropical regions around the world as one of the critical final step in atmospheric biogeochemical cycles. The **DEBITS activity** is a long-term project within the framework of IGAC, with strong linkages with the **WMO GAW** (Global Atmosphere Watch) program.

Long-term studies on atmospheric deposition provide critical information on the temporal and spatial evolution of changes in the atmospheric chemistry of the planet due to various natural and anthropogenic influences on the atmosphere. In order to determine the impact of anthropogenic influences and climate change on the planets biogeochemical functioning and impact on the society in large, the DEBITS strategic plan is to facilitate and promote atmospheric studies in tropical regions around the world. The DEBITS database has been particularly of interest and integrated in the last WMO deposition assessment published by Vet *et. al.* in 2014.

Firstly, the workshop was aimed at strengthening the sub-regional monitoring networks in the tropics and to take advantage of the long term experience of well established international networks in the USA, Canada and Europe. IDAF (the African Network) has been expanded to became the INDAAF (International Network to study Deposition and Atmospheric chemistry in AFrica) and is operational with very good success since 1994. IDAF is also recognized as an official contributing

Rochester, NY, USA

network of the WMO GAW program. Sustaining deposition monitoring activities in South America and South Asia have, however, been more challenging for DEBITS in the past and the workshop focused on new ideas how to establish similar participating networks in these important regions from a global scientific perspective.

Secondly, DEBITS needed to consider repositioning itself and its activities to meet the new visions and aims of IGAC and WMO. IGAC enters into its third phase as a research project in **Future Earth** and recognizes the need to develop a multi-disciplinary approach to focus on "atmospheric chemistry research towards a sustainable world." Considering, WMO GAW requirements, long term networks are encouraged to become contributing networks and included in the GAW network as contributing stations (GAW SIS.)

The workshop started with an historical introduction of the initial aims and what has been achieved since the establishment of DEBITS in 1990. This was followed by a brief introduction of the objectives of the workshop and talks by the Principal Investigators (PI's) of each region. The present initiatives in South America, South Asia and Africa were presented as well as the new structure and new implementation plans for South America and South Asia (e.g. the DRSNet-India Deposition research through Student network in India). PI's of the other international networks (EMEP, NADP, CASTNET, CAPMoN) presented the requirements and the challenges in the long term monitoring activity and emphasized the importance of deposition monitoring in tropical areas represented by DEBITS.

It became clear that a strong need still exists to coordinate and support atmospheric deposition research, especially in developing countries and in tropical regions around the world as was also pointed out in the recent global assessment on deposition (see conclusions **Vet et al, 2014**.) Maintaining and strengthening programs like DEBITS is viewed as being essential. Collaboration and coordination are largely lacking in these areas and are mostly subject to sporadic and unsecure availability of funding for these activities. In the developed world by contrast, the need of sound information on deposition is recognised by governments and these studies are mostly support via governmental programs. Programs like DEBITS are needed to facilitate and support these type of studies in the developing world to enable participants to obtain funding support via different research funding agencies and other structures. The above mentioned situation also necessitates close collaboration with governmental supported programs and future initiatives should be linked more formally with such programs. A strong link should be developed with well established and good functioning regional networks such EMEP (Europe), NADP and CASNET (USA), CAPMoN (Canada) and EANET (Japan.)

It has been communicated that DEBITS is endorsed by IGAC as a long term project and is supported by the WMO GAW program through the strong link with the newly established WMO advisory group on total atmospheric deposition (WMO SAG on TAD.) In the next months, DEBITS should define a new SSC and propose a scientific plan with new issues adressed in the next phase of the project.

9-10 August, 2015
Beijing, China

IGAC Endorsed

International Workshop on Heterogeneous Kinetics Related to Atmospheric Aerosols

AUTHORS

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Tong Zhu, Peking University, China

Satoshi Inomata, National Institute for Environmental Studies, Japan

HOST INSTITUTION

FUNDING

National Institute for Environmental Studies

Japan National Committee

IGAC China WORKING GROUP

PARTICIPANTS

China, Denmark, Germany, Japan, Singapore, USA.

BACKGROUND

FUNDAMENTALS ATMOSPHERIC CHEMISTRY

This workshop was endorsed by IGAC as part of the IGAC activity Fundamentals of Atmospheric Chemistry, which emphasizes the importance of and fosters fundamental research in advancing the field of atmospheric chemistry.

Workshop Participants

Atmospheric aerosols play a critical role in air pollution and climate change. There is growing evidence that the heterogeneous reactions on the surface of aerosol particles and the reactions in the liquid phase could have significant implications for the impacts of aerosols on air quality and climate change. However, the evidences on the heterogeneous kinetics related to atmospheric aerosols based on field observations, laboratory studies, and model simulations are not yet fully consistent.

About 60 scientists from China, Japan, the United States, Germany, Singapore and Denmark participated in the two-day workshop. Two speakers, Profs. Neil Donahue (Carnegie Mellon University) and Vicki Grassian (Iowa University) were invited to give keynote speeches, which covered the topics of formation mechanisms of secondary organic aerosols (SOA) from toluene and other hydrocarbons, and heterogeneous reactions on sea spray and mineral dust particles, respectively.

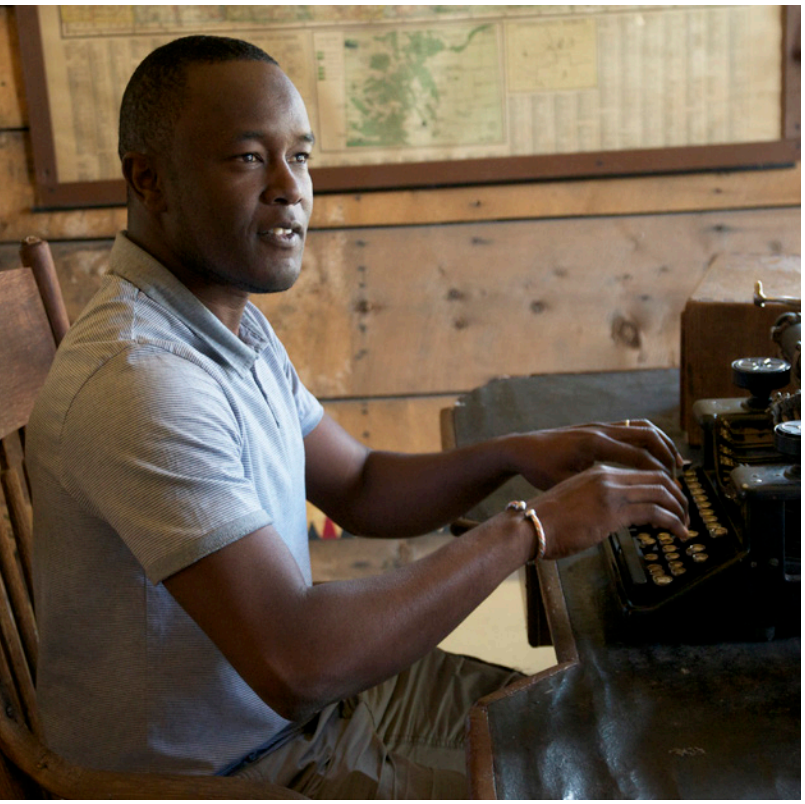
Venue in Beijing, China

The workshop was opened by an overview talk by H. Akimoto on heterogeneous reaction chemistry related to SOA formation. Several talks followed on the topic of SOA formation kinetics which covered the formation of oligomer and high-molecular weight (HMW) compounds from alkene, isoprene, α-pinene and aldehydes with and without preexisting $(NH_4)_2SO_4$ particles, including the multiphase aerosol chemistry of PAH oxidation and its impacts on human health. Saturation concentration and volatility estimation were discussed which related to aerosol modeling including the VBS sub-model. Experimental studies on the uptake of gaseous species on aerosols were reported for H_2O_2 and SO_2.

One quantum chemistry study was presented by one of the invited speakers, Prof. A. Morita, who showed the characteristics of liquid interface revealed by theoretical calculations, together with the results of a spectroscopic experimental study. He also discussed the surface characteristics of aerosols at the water surface, including the difference of ionization equilibrium at the surface, which are different from those in the bulk solution.

A couple of presentations covered the topics of field observations and aerosol modeling. The workshop was concluded by the closing speech of T. Zhu, who discussed the challenge of the research on heterogeneous reactions in the atmosphere.

The Second International Workshop on Heterogeneous Kinetics Related to Atmospheric Aerosols has been decided to be held on November 12-13, 2016 in Tsukuba, Japan.



Thierno Doumbia

Thierno Doumbia is currently a post doc at Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS) – Pierre and Marie Curie University in Paris, France. Thierno is originally from Senegal and completed his undergraduate studies at the University of Dakar and his Master of Sciences in Meteorology and Oceanography at the Laboratoire de Physique de l'Atmosphère et de l'Océan – Simeon Fongang (LPAO-SF), one of the laboratories of the Polytechnic Higher School of Dakar (ESP), a public institution of the University Cheikh Anta Diop (UCAD). Thierno earned his PhD in Atmospheric Science from the University of Toulouse at the Laboratoire d' Aérologie in France in 2012. Thierno's research currently focuses on the analysis of the long-term changes and spatial and temporal variability of several atmospheric compounds using chemistry-climate models. In addition, he is interested in the quantification of emissions, and more particularly in the characterization of emissions from gas flaring using satellite data.

Thierno Doumbia participated in the 17th GEIA Conference and was the recipient of an IGAC Early Career Travel Grant to attend the conference.

What was the highlight of 17th GEIA Conference for you?

Attending this conference gave me answers to some scientific questions that have emerged during my research. I enjoyed the early career scientists program, which allowed me to meet other scientists from many different countries. I am also working on a project focusing on forecasting air quality in China and the discussions I had with Chinese colleagues gave me new ideas for future work. I also really appreciated the efforts made by the organizers to promote the interconnection between the different themes and the knowledge exchange between participants.

Being from a region of the world, West Africa, that is often underrepresented in the scientific community, what do you hope to achieve by participating in an international organization such as IGAC?

It is indeed a pity that so few African scientists are involved in international organizations such as IGAC. This is the reason that led me to want to be among the scientists who will promote international organizations such as IGAC and continue their actions in this part of the world. I think these organizations will always need knowledge of local researchers having experience in specific local features to succeed in their mission.

Was there an event, influential individual or childhood dream that lead you to become a scientist? If not, what lead you to pursue a career in science?

Allow me to answer this with a short story. Since I was young (like 16 years old), my family and I lived very close (less than 2 km) from a cement factory in Senegal. For many years, I experienced the negative impacts of the emissions from this industry on the population living around this factory. During secondary school, my favorite disciplines were mathematics and physics. After my high school diploma, I decided to study physics and chemistry at the University. After four years of university, I decided to start a Master degree. During my Master internship, I had the opportunity to choose air pollution among many topics for my Master work, and I continue to work on this topic for my PhD. I still enjoy working on themes related to air pollution!

What is the most useful piece of advice you have received from the numerous senior scientists you have worked with?

The colleagues I have discussed with during the previous years convinced me that the studies I am involved in benefit a lot from interactions at the international level. Discussions I had with many colleagues also showed that air pollution from human activities is starting to be a major issue in many African countries, and this problem will become more and more important in the coming years.

What do you most often find yourself doing for fun when you're not busy pushing the limits of the knowledge of mankind?

Cooking!

science feature

Why do we do the science we do?

AUTHOR

A. R. Ravishankara,
Colorado State University, USA

BACKGROUND

As part of the 2014 joint iCACGP Symposium/IGAC Science Conference in Natal, Brazil, Professor A.R. Ravishankara gave a keynote presentation on "Why do we do the (atmospheric) science we do." In 2015, A.R. Ravishankara published a guest editorial in *Current Science* on this topic. Here, the article in *Current Science* is being reproduced with permission from the journal.

Ravishankara, A.R. (2015). Why do we do the science we do? Current Science, Vol. 109, No. 4., 25 August 2015.

IN THE BEGINNING OF MODERN SCIENCE, it was human curiosity that led to exploration, formation of ideas, development and testing of hypotheses, and formation of theories that could predict. How do things work in our world? Why do they work the way they do? Can we predict how things will work in the future? Clearly, these questions were the basis of human scientific intrigue. There were discoveries, inventions and advances that went along with these inquiries. These activities were carried out by a small number of scientists, often supported by patrons or by the scientists themselves.

Some time along the way, interest emerged in not just understanding, but manipulating our surroundings. Often, this manipulation of nature or objects within our world started to be a bigger goal. Humanity has engaged in this process for its benefit for a long time – be it benefit for all or benefit for a smaller set of people. Technological advances to win wars have been major drivers in many cases. Think of cannons, gunpowder, missiles and nuclear weapons, for example. Of course, many other discoveries and emerging scientific areas followed these pursuits. Thermodynamics is a case in point; it developed upon realizing that work and heat were related while boring cannons and the generation of heat that followed. The pursuit of converting heat to work was at the inception of the Industrial Revolution. The ability to create work from energy was a major accomplishment that has driven industrialization.

During the late 1800s, science became more than a curiosity-driven endeavour. However, one could argue that this transition started much farther back. But by the 20th century this trend was clearly evident. After the Second World War, there was a line of thought that was essentially codified as to how science leads to use. Indeed, this is evident even today. It was asserted that there is a progression from the basic science to applied science and then to engineering to application and products. Often this codification is attributed to Vannevar Bush, and is a simple linear model.

This linear concept of a march towards practical use has been ingrained in many ways, including how we classify fields of research, how we fund research efforts, and how we then recognize and reward such research. For example, the US military has clear classifications of its research funds: 6.1 – basic research; 6.2 – applied research; 6.3 – advanced technology

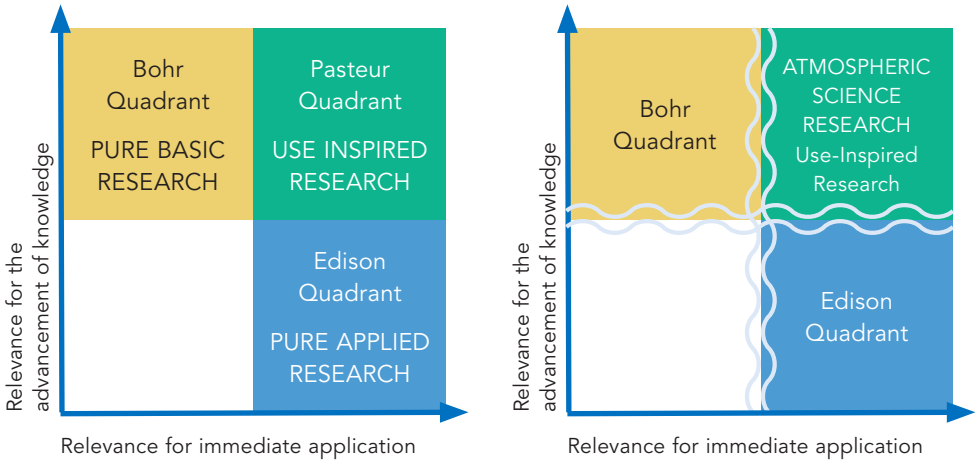


Figure 1. (Left panel) Separation of research into quadrants based on their relevance for advancement of knowledge and relevance for immediate application. These axes have been alternatively labelled as quest for fundamental understanding and consideration of use (adapted from Stokes[1]). (Right panel) Author's rendition of these quadrants with the assertion that atmospheric science falls into Pasteur's quadrant and that the separation between the quadrants is not rigid as shown by the overlaps and the fuzzy separators.

development; 6.4 – demonstration and validation, and so forth. Certainly, this paradigm is based on the linear model noted above. Moreover, this paradigm is ingrained and likely followed in nearly all fields of research, all over the world.

There is another way to think about this progression towards application and product. The microbiologist Louis Pasteur is famously quoted as saying: 'There are no such thing as applied sciences, only application of science.' This is a different thought process than the linear model. Indeed, Donald Stokes in his seminal book *Pasteur's Quadrant*[1] argues that there is a different way to look at research and transition of research to application than the linear model noted above.

Stokes[1] classifies our pursuit of knowledge into quadrants (Figure 1). Clearly, pure basic research is done solely for the advancement of knowledge, with little or no concern to relevance for immediate applications. It is important to remember that the emphasis is on the immediate applications. We all know the enormous eventual relevance of pure basic research to our current technology and perception of world around us – be it the atomic theory or recognition of the structure of DNA or infinitely many other discoveries. Stokes named it the Bohr quadrant after Neils Bohr, one of the fathers of atomic theory. The premise here is that Bohr's work was done solely for the purpose of understanding matter. The fact that Bohr's ideas were central to the development of the nuclear bomb, nuclear energy or nuclear medicine is a fallout – not the primary intent of his work.

Then, there is the work done with the sole purpose of application. Such work may advance our basic understanding, but it is not the primary purpose – the ultimate applicability is the guiding force of such an endeavour. Stokes called it the Edison quadrant, after the eminent inventor Thomas Edison. The premise here is that Edison's work was done solely for the purpose of making widgets and products that were useful and led to economic benefits. Clearly, there were advances in our knowledge as a result of this work. However, in this case they were fallouts of the work, rather than the intent.

Then, there is the top right quadrant – where the goals are relevant *both* to advancing our knowledge and to the immediate application. Stokes called this Pasteur's quadrant which is *use-inspired*. (This is not to be confused with user-inspired.) Working in this quadrant, scientists have goals of advancing science to provide immediate useful results. (Of course, there is the fourth quadrant, which we will not even discuss.) The lines that separate these quadrants are indeed fuzzy. As shown in Figure 1 (right panel), they are likely to be in the eyes of the beholder. However, this classification has some major attractive features as well as ramifications.

Now science has become a profession with a large number of active scientists; it is not merely an activity supported by patrons. Countries want to advance the knowledge base to make lives better for their citizenries. Sometimes, taxpayers fund the research efforts. Other times, industries fund research to make a profit. Either way, the expectation for a return on their investment is both logical and appropriate.

Having worked in field of atmospheric science for more than three decades, my assertion is that this field falls squarely in Pasteur's quadrant. After all, most of the atmospheric scientists claim that we work on societally relevant issues: weather prediction, climate change, air quality, water supply for food growth, to just name a few. Indeed, there are some components of atmospheric science that could be viewed as being in the Bohr quadrant (e.g. original ideas of atmospheric dynamics) or the Edison quadrant (e.g. building sensors for atmospheric research). However, because it is a new and fast-emerging field with relevance to immediate use, I suggest that atmospheric science be viewed as use-inspired research that falls squarely in Pasteur's quadrant, much in the way of microbiology or medical research. In the beginning, atmospheric science was indeed driven by curiosity. However, it has evolved to be use-inspired research.

So what does it mean to be working in Pasteur's quadrant? First, it means that the science and research we do is aimed towards an ultimate use. This has to be acknowledged. Use must be a primary motivation for the research we do. Second, there is much information that is not available; therefore, such information has to be developed. In the process, we have to stray from the goal of immediate use, but return to it as the developed knowledge advances our science. Third, this means we have to go where the needs are – not just do what interests us to fulfil our curiosity. Even though this separation between curiosity-driven science and use-inspired research is a grey area and often varies from person to person; also, the same person may be engaged in both kinds of research. (For these reasons, I have overlapped the quadrants and drawn the fuzzy separators!) Fourth, we must judge the value of the science and the researcher for producing information that is useful and used. For example, the reward system for the 'profession of research' may have to be thought out differently than just the number of papers published. Fifth, it is likely that this is a progression in many sciences. Atmospheric science was indeed originally driven by curiosity. Indeed those discoveries were pivotal for advances in much of physical science. Take for example, the discovery of oxygen in air, pressure changing with altitude, or spectral features of sunlight leading to the field of spectroscopy. Indeed, one can think of many other such features of a use-driven science that falls in Pasteur's quadrant as well as the ramifications of being viewed as use-inspired.

It is possible that many researchers in other areas also view their science as use-inspired research. So in conclusion, I ask you to ask yourself – does your research fall in the Pasteur's quadrant with all its ramification? IGAC

1. Stokes, D., *Pasteur's Quadrant: Basic Science and Technological Innovation*, Brookings Institution Press, Washington DC, USA, 1997.

Save the Date!

The 14th biennial IGAC Science Conference will be held 26-30 September 2016 in Breckenridge, CO USA. The Local Organizing Committee is chaired by Christine Wiedinmyer (NCAR, Boulder, CO, USA). The Scientific Programme Committee is co-chaired by IGAC SSC members Claire Grainer (LATMOS, Paris, France and NOAA CSD/CU CIRES, Boulder, CO) and Hiroshi Tanimoto (NEIS, Japan). Please stay tuned for more details at **igac2016.org**!

Atmospheric chemical mechanisms for future air quality problems

AUTHORS

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BACKGROUND

The 2014 Atmospheric Chemical Mechanisms Conference was endorsed by IGAC as part of the IGAC activity Fundamentals of Atmospheric Chemistry, which emphasizes the importance of and fosters fundamental research in advancing the field of atmospheric chemistry. This editorial builds on the conference seeking to build up a sustained, coordinated and international commitment on atmospheric chemical mechanisms.

An atmospheric chemical mechanism, commonly referred to as a chemical mechanism, is the means by which atmospheric chemistry is represented in chemistry-transport models (CTMs). Our particular concern is with the CTMs that are used in research and policy applications to predict the complex behaviour of air pollutants such as ozone and $PM_{2.5}$. The effectiveness of policies developed to reduce ozone and $PM_{2.5}$ exposures critically depends on how well the chemical mechanisms describe real-world behaviour. It is essential that chemical mechanisms utilise the best and most up-to-date science so that policy development is based on CTM predictions that are robust, transparent and free from scientific challenge. Because we are concerned that this may not be the case in the future, we have proposed a program of coordinated effort under four discernible stages: an ongoing process that continually tracks new research into atmospheric chemistry; compilation of reference mechanisms; chemical mechanism evaluation; and mechanism reduction so that new mechanisms can be handled by policy-relevant CTMs. Further details of the four stages are given elsewhere (**Kaduwela et al., (2015). New Directions: Atmospheric chemical mechanisms for the future. Atmospheric Environment, 122, 609-610**).

While some aspects of the above four stages of mechanism development are already in place, they have been developed independently, with little consideration of the other stages in the mechanism development process. For example, condensed mechanisms are often developed without considering the effects of condensations on model predictions and mechanisms are developed or revised and used without adequate evaluation or re-evaluation. The lack of coordinated funding in this area has contributed to a focus on quick fixes, rather than on a stable, transparent, peer-reviewed process for sustainable updating. Recent Governmental funding and research priorities have focussed primarily on laboratory research, field measurement campaigns and policy-relevant air quality modelling. These are important building blocks but they are not sufficient in their own right to ensure that we will be using the best science in air quality models when assessing emerging air quality issues.

It has been said that all the best science in the world, without translation into policy, really is of no practical value in the world of tomorrow. If you have any sympathy with this viewpoint, please consider how your own research may have some impact in the future on how ozone and $PM_{2.5}$ formation is described in CTMs and how they respond to reductions in precursor emissions. You may consider attending the Atmospheric Chemical Mechanisms 2016 Conference, a biennial conference at the University of California, Davis, USA which is being planned for December 2016. This conference will have this issue and the concerns that surround it, as its guiding theme. A previous conference in this series, ACM 2014, was endorsed by IGAC (see **IGACnews, Issue No. 54**).

Our aim is to build up a sustained, coordinated and international commitment that can serve not only to develop robust chemical mechanisms for current applications but also to ensure that air quality models can evolve to suit future research and regulatory applications. IGAC

14-16 September 2015
Istanbul, Turkey

Workshop on High Air Pollution in the East Mediterranean: Open issues on emissions, mitigation and health impact

AUTHORS

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Alper Unal, Eurasia Institute of Earth and Sciences, Istanbul Technical University Ayazaga, Istanbul, Turkey

HOST INSTITUTION

FUNDING

PARTICIPANTS

France, Turkey, Lebanon, Greece, Cyprus, Algeria

Workshop Participants

The East Mediterranean Basin: a highly sensitive environment under considerable pressure.
Future decadal projections point to the EMB as a possible hot spot of poor air quality and predict a continual and gradual warming in the region, much stronger than other regions. The increase and accumulation of anthropogenic emissions of gaseous and particulate pollutants from surrounding urban areas are suspected as one of the key compounding factors of those environmental impacts.

High pollution loadings and uncertainties in anthropogenic emissions.
The quantification of emission distribution is a challenge, especially in cities of the EMB where local emission data are sparse. While some highly resolved inventories have been developed at the regional scale in the EMB area for cities like Beirut and Istanbul, their uncertainties are unknown. In addition, there is a strong need for developing better emission inventories in the Middle East region as a whole. The paucity of observations in this region, especially for VOCs and PM composition, is a strong limitation to the achievement of evaluated emission inventories.

open submissions

Istanbul, Turkey

Air Pollution: one of the most important factors affecting human health in the East Mediterranean. According to a study of the World Health Organization (WHO) published on the 25th of March 2014, "in 2012 more than 400,000 Eastern Mediterranean (including Iran, Iraq, Pakistan, Afghanistan, UAE and Sudan) citizens died prematurely as a result of air pollution". WHO is convinced that ambient air pollution is among the most important risks to health in the region. As such, air pollution has become "one of the top priorities" of WHO in the region and "was identified by the Regional Environmental Health Strategy and Action Plan 2014-19 which was endorsed by the 60th session of the EM Regional Committee" in February 2014 (ref. EM/RC60/12-E).

On September 14th-16th 2015, more than 30 scientists including groups from the Eastern Mediterranean countries met at Istanbul Technical University in Istanbul, Turkey, in order to discuss recent results and to build an integrated and innovative strategy to assess the state of atmospheric pollution and its health impacts at urban and EMB scales, at present and for the next decades. Most recent results on the above mentioned topics and open issues have been discussed.

Four themes divided in four sessions have been addressed during the workshop: (1) Anthropogenic emissions in the Mediterranean (2) Observations as constraints for emissions mostly based on the most recent observational campaigns in the region (ChArMEx, ECOCEM, TRANSEMED, CyAr…), (3) Air quality and regional climate change, and (4) Air quality and health impacts with a special focus on in the southern and eastern Mediterranean countries providing specific examples towards a future global health impact assessment of short and long-term impact of air pollution in the region based on new tools of air pollution exposure (satellite, remote sensors, modeling…).

community

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