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IGAC News

Coordinating and fostering atmospheric chemistry research towards a sustainable world

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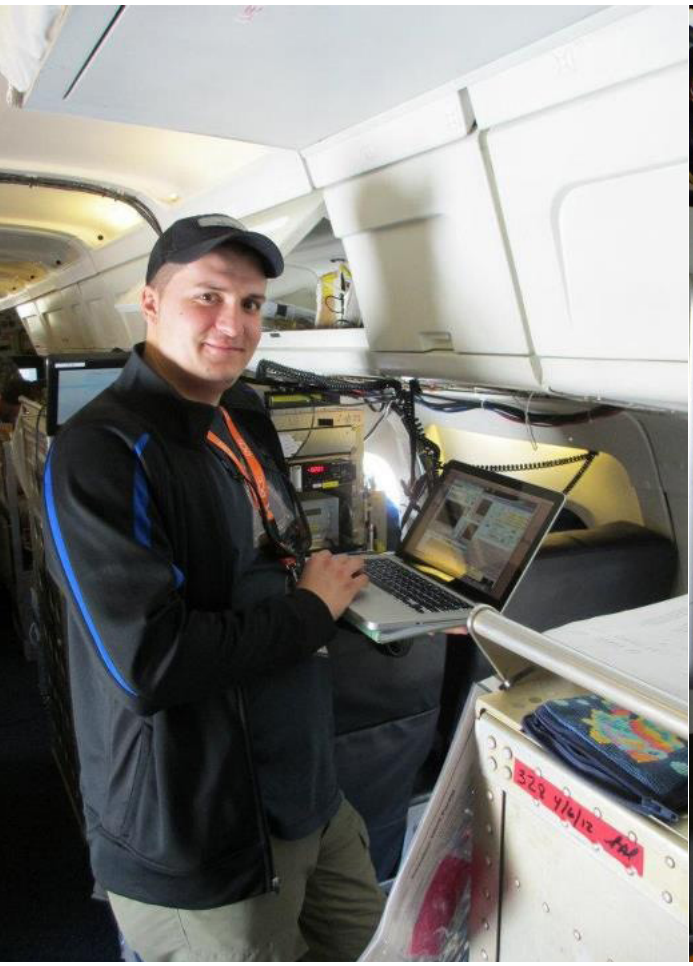

Dr. Milos Markovic* onboard the NASA DC8 during the Deep Convective Clouds and Chemistry (DC3) field study in May 2012. He is operating the Humidified Dual Single Particle Soot Photometer (HD-SP2) instrument, which measures the ambient black-carbon mass size distribution in dry and humidified sample air. (Right) The instrument is comprised of two SP2 units from Droplet Measurement Technology Inc. (Boulder, CO, USA). One (wet) is retrofitted with a custom humidification system. The combined instrument data can be used to constrain the water uptake of black-carbon-containing aerosol.

** NOAA Earth System Research Laboratory and Cooperative Institute for Research in Environmental Sciences, Boulder, CO USA*

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In Cooperation with IAMAS Commission on Atmospheric Chemistry and Global Pollution

GLOBAL CHANGE IGBP International Geosphere-Biosphere Programme

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Editor: Megan L. Melamed
Assistant Editor: Jeff Jennings
Newsletter Design: Robin L. Strelow
IGAC logo: Linda Kubrick

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IGAC News

IGAC was formed in 1990 to address growing international concern over rapid changes observed in Earth's atmosphere. IGAC operates under the umbrella of the International Geosphere Biosphere Programme (IGBP) 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). The IGAC European Project Office is hosted by the Italian National Research Council and by the European Commission Network of Excellence (ACCENT Plus). 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.

Many Thanks to Outgoing IGAC Co-Chair Tong Zhu

With apologies to the Sound of Music, when it comes to writing a piece about outgoing IGAC co-chair, Professor Tong Zhu, "what do you say about a man like Tong?". Tong joined the IGAC SSC as a member in 2006 and served as co-chair of the IGAC SSC from 2009-2012. His 8 years on the IGAC SSC raised the profile of the substantial atmospheric chemistry work that has been taking place across Asia in projects relating to laboratory studies, field observations, air-surface exchange and the health effects of air pollution. He is very well known for his role as the Principal Investigator and the initiator of the international collaborative research programme CAREBEIJING, which had more than 200 scientists and students taking part and led to the formulation of air pollution control measures that improved air quality for the 2008 Beijing Olympics. One of his major contributions to IGAC was leading two significant activities on megacities that resulted in coordinated measurements of aerosols and oxidants throughout Asia and the publication of the *WMO/IGAC Impacts of Megacities on Air Pollution and Climate Change* report; this report has had a substantial international impact in setting the agenda for research on the impacts of urbanization in relation to air quality and climate.

Tong has been a tireless servant of IGAC, traveling around the globe in order to represent IGAC in a range of activities, never complaining about the burden of such large amounts of travel. Tong will also leave a lasting legacy to IGAC in having put together the substantive IGAC China Working Group, which is bringing together scientists from across China in support of IGAC activities in that country. There is no doubt that the crowning jewel moment was the excellent IGAC biennial conference in Beijing in September 2012, organized by the IGAC China Working Group under Tong's leadership. The venue organisation and supporting programme ran without fault. Many of us will remember the amazing after dinner entertainment, from the ghost dance to singing by the Beijing Opera.

There is little doubt that Tong leaves IGAC a richer place for his involvement and commitment. He will be truly missed from the SSC when he steps down as IGAC Co-Chair *ex-officio* after the upcoming 2014 IGAC SSC Meeting in Kruger National Park in South Africa. To take the Sound of Music analogy one step too far, there is no doubt that Tong has 'climbed every mountain' for IGAC and we find that 'the hills are alive' with his science.

Sincerely,
Paul S. Monks, IGAC Co-Chair, University of Leicester, UK
Sarah Doherty, former IGAC Executive Officer, University of Washington, USA
Kathy S. Law, former IGAC Co-Chair, LATMOS, France

2013 IGAC Scientific Steering Committee

The 2013 IGAC Scientific Steering Committee (igacproject.org/SSC) has two new members, Colette Heald of the Department of Civil and Environmental Engineering/ Department of Earth, Atmosphere and Planetary Sciences at the Massechusetts Institute of Technology (MIT), Boston, MA, USA and Tao Wang of the Department of Civil and Environmental Engineering at Hong Kong Polytechnic University (Poly U), Hong Kong, China. Collette and Tao join the IGAC SSC's 17 continuing members under veteran Co-Chair Paul Monks of the University of Leicester and recently appointed Co-Chair for 2013 Allen Goldstein of the University of California, Berkeley.

Colette Heald is an Associate Professor in the Departments of Civil and Environmental Engineering & Earth Atmosphere and Planetary Sciences at MIT. She received her undergraduate degree in Engineering Physics from Queen's University in Canada in 2000, and her PhD in Earth and Planetary Science from Harvard University in 2005. She held the NOAA Climate and Global Change postdoctoral fellowship at the University of California Berkeley from 2006-2007. Colette heads a research group in global atmospheric chemistry that addresses issues in long range transport of pollution, the interactions between the biosphere and atmosphere and the evolution and impacts of atmospheric particles. A particular focus of their work is using observations at all scales (surface, aircraft and satellite) to investigate and improve global models. Colette is a member of the GEOS-Chem model Steering Committee and the Community Earth System Model Advisory Board.

Tao Wang is a professor at the Department of Civil and Environmental Engineering at PolyU. He received his PhD in Atmospheric Chemistry at Georgia Institute of Technology in 1992 and then conducted postdoctoral research at University of Michigan-Ann Arbor. His earlier work was field investigation of reactive nitrogen and ground-level ozone, in association with the SOS, NARE, and PEM-West programs. Since joining PolyU in 1995, he has initiated a number of field studies of trace gases, aerosol, and cloud composition in megacities, rural and remote regions of China mainland and Hong Kong. He has been involved in international studies including TRACE-P, ACE-Asia, China-MAP, and ABC. His recent research focuses on heterogeneous chemistry of reactive nitrogen (e.g. hydrolysis of denitrogen pentoxide) and the impact on radical budget and aerosol formation. He is an associate editor for *Journal of Geophysical Research, a guest editor for Atmospheric Chemistry and Physics*, and also on the editorial board of *Journal of Atmospheric Chemistry and Atmosphere*. He served as chief scientist for a China Key Basic Research Project on acid deposition during 2005-2010 and on the Engineering Panel of Hong Kong Research Grants Council in 2006-2010. He is an author of over 100 peer-reviewed scientific papers.

Formation of the IGAC India Working Group

IGAC is proud to announce it is now supporting the formation of an India Working Group, with the organizing led by Dr. Sachin Gunthe of the Indian Institute of Technology Madras. The India working group will join IGAC's China working group and Americas Working Group in advancing the reach and coordination of international atmospheric chemistry research.

AICI Co-Chair Publishes Commentary in *Nature*

Thornsten Bartels-Rausch, Co-Chair of the IGAC activity Air-Ice Chemical Interactions (AICI), has a short commentary in *Nature* on "Ten things we need to know about ice and snow" (igacproject.org/misc/2013BartelsRausch.pdf). In it Thornsten emphasizes the need to understand the molecular behavior of ice in order to predict the future of our planet.

WMO/IGAC Report on Impacts of Megacites on Air Pollution and Climate

The final version of the WMO/IGAC Report on *Impacts of Megacities on Air Pollution and Climate* was released in January 2013. The report is the culmination of a five-year effort involving over 80 co-authors, led by former IGAC Co-Chair Tong Zhu of Peking University. It covers megacities in Africa, Asia, South America, North America, and Europe in addition to chapters on field campaigns in megacities and an outlook to the future. Read the assessment at igacproject.org/Megacities.

IGAC Now on Social Media

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

IGAC Has a New Student Assistant

Jeff Jennings joins the IGAC office at the University of Colorado at Boulder. Jeff recently received his undergraduate degree from the University in the fields of Environmental Sciences and Evolutionary Biology, and is applying to Masters programs in Renewable Energy Systems.

Bounding the Role of Black Carbon Report Makes Headlines

As part of the IGAC/SPARC Atmospheric Chemistry & Climate (AC&C) activity, *Bounding the Role of "Black Carbon in the Climate System: A Scientific Assessment"* was published in the *Journal of Geophysical Research* in January. The result of a four-year effort of 31 co-authors under leads Tami Bond, Sarah Doherty, David Fahey, and Piers Forster, the report was met with international news recognition upon its release. Media outlets including the New York Times, BBC, Science, and Nature highlighted the importance of the report. Read a summary of the report in this newsletter, and find the full report at igacproject.org/BoundBlackC.

Submit Articles to the next IGAC Newsletter

The next upcoming IGAC newsletter is now open for article submissions! Workshop Summaries, Science Features, Activity News, and Editorials are all acceptable and desired. Science Features are to be submitted at a recommended length of approximately 1500 words with 1-2 images. All other submissions must be approximately 600 words and have a maximum of 1 image. Images MUST be high resolution and sent as a separate file. The deadline for submissions for the July Issue of the IGAC Newsletter is 30 June 2013. Any questions concerning content or formatting may be sent to info@igacproject.org.

IGAC Events Proposal Submissions

If you are interested in receiving support for workshops related to IGAC's Activities and Vision, look no further. IGAC provides financial support and non-financial endorsements of meetings, workshops, symposiums, and conferences. Sponsored events are required to publish an event summary in the IGAC Newsletter and IGAC may request a Science Feature or Young Scientist Spotlight article related to the workshop topic. Please visit igacproject.org/igac-events to learn more about how to submit a proposal for an IGAC sponsored event. Any questions regarding proposals or to submit a proposal please write to info@igacproject.org. The deadline for proposal submissions occurs three times per year with the next deadline being **30 June 2013**.

Megacities in the Coastal Zone

SOLAS liaison to IGAC Roland von Glasow and fellow professor Tim Jickells summarize the findings here:

Megacities and large urban agglomerations are usually defined as having more than 10 million inhabitants and are characterised by a particularly high population density. More than 10% of the world's population live in megacities, and this proportion is expected to increase in coming decades. Even though a very large number of megacities are located at the coast, there has not been a systematic consideration of the additional pressures and effects that the location of this juxtaposition of land and ocean has. To address this, a SOLAS/IGAC/LOICZ fast track initiative held a workshop in Norwich in April 2010 sponsored by IGBP/SCOR. The attending scientists had expertise in various aspects of atmospheric and marine physics and chemistry as well as in marine biology. The focus of the workshop was on the physical and biogeochemical interactions between the atmosphere, the land and the ocean in and around coastal megacities. These relate to air and water quality as well as regional climate and hence directly affect human wellbeing. In the workshop we were able to identify what we believe to be the following most important environmental issues: Effects on the self-cleansing capability of the atmosphere (in the megacity and its outflow); Greenhouse gases: sources, atmospheric lifetime; Pollution and health; Coastal eutrophication and resulting effects including on fisheries; Atmospheric circulation/mixing; Hydrological cycle; Radiative forcing caused by the Megacities in the Coastal Zone. The outcomes of this workshop have now been published: von Glasow et al, "Megacities and Large Urban Agglomerations in the Coastal Zone: Interactions Between Atmosphere, Land, and Marine Ecosystems", AMBIO 2013, 42:13–28, DOI 10.1007/s13280-012-0343-9.

Bounding the Role of Black Carbon in the Climate System: A Scientific Assessment

Tami C. Bond, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Urbana, IL USA (yark@illinois.edu)

Sarah J. Doherty, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington, Seattle, WA USA (sarahd@atmos.washington.edu)

David W. Fahey, Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Boulder, CO USA (David.W.Fahey@noaa.gov)

Piers M. Forster, School of Earth and Environment, University of Leeds, Leeds, UK (p.m.forster@leeds.ac.uk)

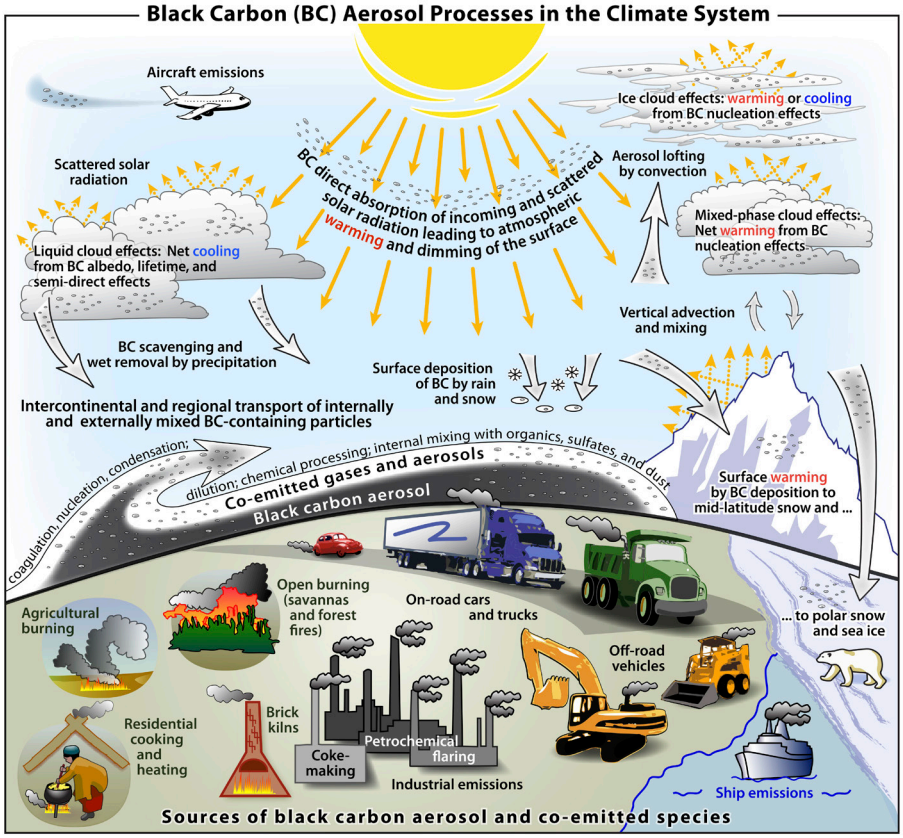


Figure 1. Schematic overview of the primary black carbon emission sources and the processes that control the distribution of black carbon in the atmosphere and determine its role in the climate system [From *Bond et al.*, 2013].

National and international groups are discussing policies to mitigate short-term climate warming from agents such as black carbon (BC). In response to stated needs for evaluation of the scientific evidence, the four coordinating lead authors and an international team of 27 coauthors from nine countries agreed to conduct a peer-reviewed assessment of the role of BC in the climate system, with support from the IGAC/SPARC Atmospheric Chemistry & Climate Initiative. Four years later, in January of this year, the assessment was accepted for publication in the *Journal of Geophysical Research-Atmospheres* and is publically available online [*Bond et al.,* 2013]. Below are questions and answers that highlight some of the key points from the report.

Why should I care about black carbon? Black carbon exists in the atmosphere as small, dark particles that influence Earth's radiation balance. Although black carbon is a particle rather than a greenhouse gas, it is the second largest climate warmer, after carbon dioxide. Unlike carbon dioxide, black carbon is quickly washed out and, hence, would be quickly eliminated from the atmosphere if its emissions were stopped. Emissions arise from both natural (e.g., fires) and anthropogenic sources (e.g., fossil fuel and biofuel burning). Black carbon reductions would also improve human health by removing particulates from air we breathe.

How does black carbon affect climate? Black carbon absorbs sunlight and heats the atmosphere. It also changes the brightness of liquid, mixed-phase, and ice clouds. Black carbon deposition darkens snow and accelerates melting. All these processes as shown in Figure 1 alter Earth's radiative balance.

What are important features of the "Bounding-BC" study? Policymakers are considering actions that could slow short-term climate warming by reducing black carbon emissions. This assessment was an effort to provide the scientific information needed for such policy decisions by evaluating the climate forcing contribution of black carbon emissions. Its guiding principles

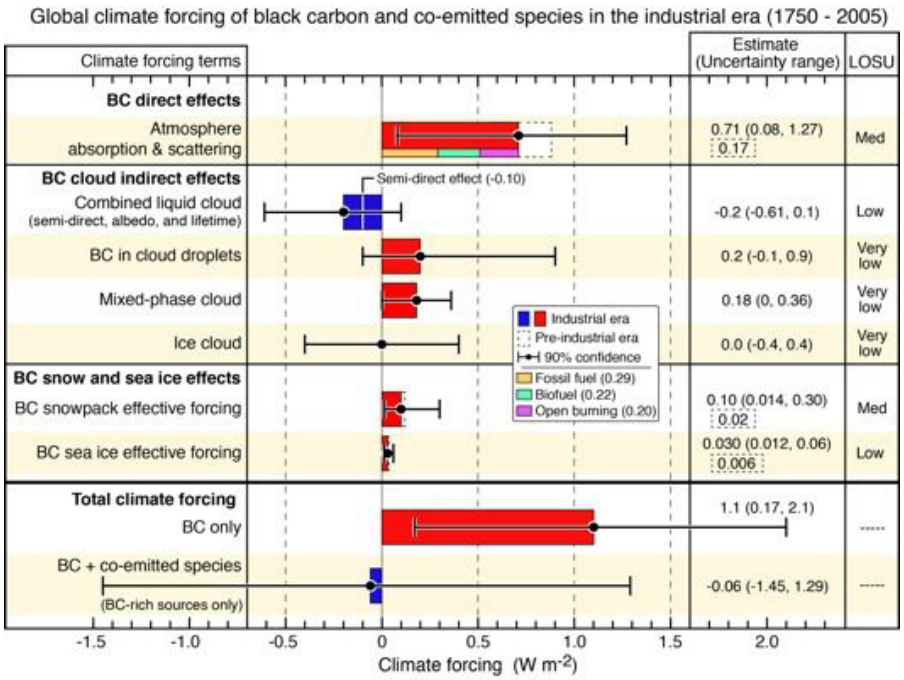


Figure 2. Estimates of black carbon climate forcing terms and net forcings for the industrial era. The bars represent best-estimate values and the whiskers represent the 90% uncertainty ranges. The total climate forcing estimates and its uncertainties with and without co-emitted species are derived using a Monte Carlo method applied to the individual terms. These estimates are a unique contribution of this assessment. The level of scientific understanding (LOSU) follows its use in IPCC. Other details can be found in the caption of Figure 9.1 in *Bond et al.* [2013].

were to be comprehensive, by including all the known ways that black carbon affects the climate system; quantitative, by providing best estimates and uncertainties using global models and observations; and diagnostic, by identifying the reasons why estimates differ.

The assessment also provides a framework to estimate climatic impacts of black-carbon mitigation actions, in contrast to traditional frameworks that focus on individual chemical species or physical effects. Our framework is designed to be updated as the science of black carbon moves forward and uncertainties are reduced.

What is the best estimate of black carbon climate forcing? The best estimate of the climate forcing of black carbon in the industrial-era (1750 - 2005) from all processes is +1.1 W m^{-2} with 90% uncertainty bounds of +0.17 to +2.1 W m^{-2} [see Figure 2]. Thus, there is a very high probability that black carbon emissions result in a positive forcing that warms climate. With this estimate, black carbon is the second most important human emission in terms of its climate-forcing in the present-day atmosphere; only carbon dioxide emissions are estimated to cause a greater forcing (+1.56 W m^{-2}).

Does the climate impact change when the influences of clouds and snow are included? Each component of black carbon forcing and its uncertainty was assessed in calculating the best estimate value [see Figure 2]. Including all effects in addition to the direct forcing increases the best estimate of climate impact (i.e., more warming). Cloud changes are not well understood, so the total effect is also quite uncertain.

Is the estimate of black carbon climate forcing different from previous work? The best estimate of climate impact from direct absorption is about a factor of two higher than most previous results, including the estimates in the 2007 assessment of the Intergovernmental Panel on Climate Change (IPCC). Many models simulate lower absorption than observed in the atmosphere and thus underestimate warming by black carbon. Causes of the mismatch include underestimated emissions in certain regions and differences in the way absorption by black carbon particles is treated in some models. A higher level of absorption was suggested by a few earlier papers and is supported by the evidence evaluated in the assessment.

What is the importance of species co-emitted with black carbon? Natural and anthropogenic sources of black carbon aerosol generally emit other short-lived species with associated climate forcings that either cool or warm climate. This assessment made a detailed effort to include the climate forcings from co-emitted species and summed these forcings to provide a combined net forcing. Important co-emitted species are sulfate aerosols and gases such as sulfur dioxide and organic species, which lead to aerosol formation. When all co-emitted species are included, the best estimate of net industrial-era climate forcing by all black-carbon-rich sources is slightly negative (-0.06 W m-2 with 90% uncertainty bounds of -1.45 to +1.29 W m^{-2}). The uncertainties in this estimate are large, due primarily to incomplete understanding of interactions of black carbon and co-emitted organic carbon with clouds.

What sources are most likely to reduce warming if their emissions are eliminated? Diesel engines are the most promising (due to the low fraction of co-emitted species) followed by some

types of wood and coal burning in small household burners and some kinds of industrial processes. Eliminating open vegetation burning is least likely to reduce warming (due to the high fraction of co-emitted species), although it could be beneficial near snow and ice. Both the immediate climate impact of air pollutants and the long-term climate change from greenhouse gases are important in assessing the climate forcing response to emissions reductions.

What are considerations in choosing mitigation options? Mitigation options for black carbon emissions vary due to the variety and global distribution of black carbon sources. In prioritizing mitigation options, non-science factors, such as technical feasibility, costs, policy design, and implementation feasibility play important roles. Each black carbon source category requires a separate analysis to evaluate its readiness for near-term mitigation.

References

Bond, T. C. *et al.* (2013) Bounding the role of black carbon in the climate system: A scientific assessment. *Journal of Geophysical Research-Atmospheres* doi: 10.1002/jgrd.50171. http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50171/abstract.

Announcement

Second Announcement and Call for papers for the 12th ASAAQ, Seoul, Korea, 3~5 June 2013

(http://asaaq12.kr)

The 12th International Conference on Atmospheric Sciences and Applications to Air Quality (ASAAQ) will be held on 3~5 June 2013 in Seoul, Korea. This Conference is being organized by Seoul National University and Korea Centre for Atmospheric Environment Research with support from other institutions, including AMS, WMO, WHO and IGAC. The Conference will cover broad topics on atmospheric sciences and air quality. Topics include: measurements and modelling of air pollutants, greenhouse gases and climate change, atmospheric chemistry and physics, air pollution meteorology and long-range transport of air pollutants, atmospheric aerosols, sandstorms and dustfall, air toxics, meteorological modelling and emergency responses, remote sensing of air pollutants, emission inventories, impact of air pollution on health, air pollutant control technologies and strategy.

For additional information, please contact Co-chairs: Professor Y S Chung (e-m: **chungys22@gmail.com**), or Professor S C Yoon (e-m: **yoon@snu.ac.kr**). Please submit abstracts (250 words limit) electronically via **http://asaaq12.kr** by **10 April 2013**. The International Journal, *Air Quality, Atmosphere & Health* (Springer) will arrange for a special issue of peer-reviewed papers.

SOLAS/IGAC HitT Workshop on the Climate Impact of Seasalt-Derived Cl Atoms

17-19 December 2012
Kiel, Germany

Roland von Glasow, University of East Anglia, Norwich, UK (r.von-glasow@uea.ac.uk)

Eric Saltzman, University of California Irvine, CA, USA (saltzman@uci.edu)

Chlorine is the most abundant halogen in Earth's crust, in ocean water, and in the atmosphere. Our knowledge about the atmospheric reaction cycles of natural chlorine in the troposphere is incomplete. Reactive chlorine contributes to tropospheric ozone cycling and to the acidity of atmospheric aerosols (as HCl), but the most global important impact of reactive chlorine may be as an oxidant for the greenhouse gas methane.

This workshop addressed the following overarching questions:

1) Is tropospheric Cl chemistry a significant aspect of atmospheric reactivity, and to what extent is it a natural vs anthropogenic effect?

2) Do we have to include chlorine chemistry in future climate models to improve the calculation of the radiative forcing and if so, what level of process understanding is required?

This workshop was organised by the SOLAS/IGAC activity "Halogens in the Troposphere" (www.HitT-task.net) and was held in Kiel, Germany in December 2012 with financial support by SOLAS and IGAC. Of the 22 participants, 8 were early career scientists. A review of the current state-of-the-art of atmospheric Cl cycling was given on day 1 through scientific presentations by the participants and the following 2 days were used to discuss how to best address the two main questions.

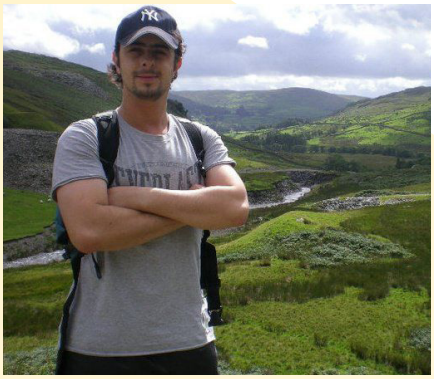
Discussions revolved around uncertainties in our understanding of Cl cycling in terrestrial and marine environments, with a focus on:

1) Factors determining the formation of $ClNO_2$ in continental air, particularly the origin and transport of HCl.

2) Developing strategies to better constrain Cl atom levels in marine air, and understanding the discrepancies between observations and models, particularly with regard to BrCl.

The discussions highlighted the need for additional laboratory, instrumentation development, field studies and modelling, and it quickly became clear that all three approaches are required to accurately assess the climate impact of atmospheric chlorine. Several funded modelling projects are ongoing (e.g., at Leeds and Norwich) which are trying to produce a global picture of the relevance of chlorine chemistry and focussed field campaigns are being planned for Europe, North America, and a marine site (most likely on Bermuda). Future progress will be assessed in focussed workshops as separate meetings or in conjunction with meetings such as the SOLAS Open Science conference.

Detailed minutes of the meeting can be found on the HitT web page.



Ryan Hossaini

(chm3rh@leeds.ac.uk)

2012 IGAC Young Scientist Travel Grant Awardee

SOLAS/IGAC HitT Workshop

Ryan Hossiani, a native of Bolton, UK, received his undergraduate degree in Environmental Chemistry from the University of Leeds. He then earned a Masters in Physics of the Atmosphere, and in October 2012 completed his PhD on Global Chemical Modeling at the Institute for Climate and Atmospheric Science (ICAS) at Leeds. Enjoying his time at Leeds, Ryan elected to continue his work there as a postdoctoral research fellow in the global chemistry modeling research group within ICAS. He is currently working on the modeling of tropospheric halogen chemistry, with the goal of improving the treatment of gas-phase and multi-phase halogen chemistry in global-scale models and assessing the impact of halogen chemistry on tropospheric composition. Within this area of research, Ryan is particularly interested in oceanic emissions of short-lived halocarbons, and his research to date has focused on modeling their tropospheric degradation and also their troposphere-to-stratosphere transport in convective cloud.

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

It is true, it's not easy! However, when you enjoy the research it helps to keep you motivated and moving forward. I would say I have been very fortunate to complete a PhD and to now work in a very supportive research group. There is a real sense of collegiality here in ICAS at the University of Leeds and this makes dealing with any major challenges less daunting. Overall, I think the biggest challenge I have faced, as a modeller, is concentration. Staring at thousands of lines of code each day can sometimes make the mind drift. This is when typos appear and bugs in code take way too long to spot!

Is there an element or aspect of your research you believe to be particularly important?

Yes, my research to date has been concerned with both ozone and climate and the interactions between the two. While ozone depletion in the stratosphere may be fairly well understood, climate change poses new challenges to the field of atmospheric chemistry as we seek to understand the atmosphere's response to climate forcing. My present work focusses on halogen chemistry and its impact on past, present day and future tropospheric/stratospheric composition. Of particular importance is assessing the role of halogen chemistry in regulating the lifetime of greenhouse gases (e.g. methane) along with other climate-relevant species (e.g. DMS).

Describe the ideal trajectory of your career over the next ten years. How has this evolved in your experiences as a young scientist?

Although ten years is a long time and it is difficult to know what the future may hold, I am pretty sure that science is for me. Ideally, I would like to pursue my research interests of composition and climate whilst remaining at the cutting edge of atmospheric science.

Also a permanent faculty position would be nice!

What is the ultimate goal of science?

Science is the concerted human effort to understand, or to understand better, the world in which we live and how that world works. The goal of science is to answer the outstanding questions and then ask some new ones. Or at least we try…

What was the most valuable outcome of the December HitT workshop and to what extent do you address this in your research?

Following the workshop it is clear that our understanding of reactive halogen chemistry in the troposphere is evolving rapidly. Unlike in the stratosphere, where halogen impacts are fairly well understood, the global impact of halogens (Cl-Br-I) in the troposphere are poorly constrained at present and tropospheric halogen chemistry is poorly treated in global-scale models. At the University of Leeds, in collaboration with the University of East Anglia, we are developing detailed multi-phase halogen chemistry mechanisms, suitable for inclusion into global models. These will be used to determine, for example, the impact of chlorine on the lifetime of methane, an uncertainty raised in the workshop, along with other halogen impacts.

SOLAS/IGAC Workshop on the role of marine gel for the emission of primary organic aerosols from the ocean

11–13 December 2012
Kiel, Germany

Caroline Leck, Stockholm University, Sweden (lina@misu.su.se)
Eric Saltzman, University of California Irvine, CA, USA (saltzman@uci.edu)

Observations from the Arctic during the last two decades question the key role attributed to dimethyl sulphide (DMS) in the CLAW hypothesis postulating that DMS from the ocean affects cloud properties and can feedback to the plankton community. This acts to regulate climate by increasing cloud albedo when sea-surface temperatures rise. In the emerging picture of the Arctic atmosphere, DMS concentration will determine the mass of the particles by producing material for their growth. But it is the number of airborne marine polymer colloidal gels or marine gels that will primarily influence the number of CCN and the resulting optical properties of the cloud droplets?

A review of research outside the Arctic does not corroborate the CLAW hypothesis for other regions as well. There is thus growing evidence that marine gels may contribute significantly to the primary marine aerosol and cloud condensation nuclei over remote areas of the oceans.

During late autumn in 2012 an international group of 13 participants met at GEOMAR in Kiel, Germany to summarize the current state of knowledge of polymer gels in the ocean and atmosphere, and to articulate a research agenda for future progress in understanding the production, emissions, and possible climate impact of these biological derived matters on cloud formation and cloud optical properties. Participants who were invited collectively spanned a broad range of expertise, including atmospheric chemistry and physics, marine microbiology and chemistry, meteorology, and cloud microphysics, as well as a broad range of research approaches, including field measurement, laboratory measurement, and modelling.

Thanks to all participating in the Gel Workshop it was a fascinating couple of days. Overall, the workshop highlighted both common and disparate perspectives across disciplines, which underscored the need for such meetings. The following examples of issues and current controversies were discussed:

- *Is the "gel theory of marine CCN" origin consistent with primary marine aerosol observations?*
- *Is the "gel theory of marine CCN" coupled to the sulfur cycle?, Does CCN activation of gels occur?*
- *What physical/chemical processes are involved?*
- *Is "downsizing" of atmospheric gel particles possible (i.e. small particles from larger ones)?*
- *Does the composition/abundance of marine surface-active gels vary spatially/temporally?*
- *Do variations in ocean biology influence variability of the primary organic aerosol?*
- *What are the connections between marine gel emissions and future environmental change: polar, costal and open ocean?*

It is clear that the marine and atmospheric communities each have unique perspectives, tools, and data to bring to bear on the role of polysaccharide gels in marine organic matter cycling, primary organic aerosol formation, and cloud condensation nuclei activity. It is also abundantly clear that by combining the collective expertise of our communities the field could be advanced rapidly.

This workshop was a step towards developing a common vocabulary and research agenda for understanding the environmental behavior and impact of these fascinating biomaterials. Going forward, there are likely to be many opportunities for international research coordination and collaboration.

IGAC/SPARC Chemistry-Climate Model Initiative (CCMI) Community Simulations in Support of Upcoming Ozone and Climate Assessments

Veronika Eyring, DLR Institut für Physik der Atmosphäre, Germany (veronika.eyring@dlr.de),

Jean-François Lamarque, National Center for Atmospheric Research, USA (lamar@ucar.edu)

The IGAC and SPARC communities have jointly defined new reference and sensitivity simulations to address emerging science questions, improve process understanding and support upcoming ozone and climate assessments. These simulations were discussed as part of the *IGAC/SPARC Global Chemistry-Climate Modelling and Evaluation Workshop* (*Davos, May 2012*) and are described in detail by *Eyring et al.* (2013). Some key aspects from this document are repeated below.

The workshop participants (see Figure 1) recommended the creation of a joint IGAC/SPARC Chemistry-Climate Model Initiative (CCMI) to coordinate future (and to some extent existing) IGAC and SPARC chemistry-climate model evaluation and associated modelling activities. CCMI has now been approved by both the IGAC and SPARC scientific steering committees. CCMI is superseding the SPARC Chemistry-Climate Model Validation (CCMVal) activity, expanding the goals and deliverables of CCMVal to include tropospheric chemistry-climate questions. Similarly, the IGAC hindcast activity is now embedded into the CCMI rather than being a separate activity, to benefit from overlapping interests and approaches of the tropospheric and stratospheric chemistry modelling communities. Also, new phases of the Atmospheric Chemistry-Climate Model Intercomparison Project (ACCMIP, see http://www.giss.nasa.gov/projects/accmip/) may merge with the CCMI activities. A white paper summarizing the goals of the CCMI will be published in the SPARC newsletters in 2013. A website for the CCMI has been created at http://www.pa.op.dlr.de/CCMI/, where further information can be found and ongoing efforts are reported.

Purpose and scope of the proposed CCMI community simulations

The **CCMI reference (REF)** and **sensitivity (SEN)** simulations for Chemistry-Climate Models (CCMs), Earth-System Models (ESMs) with interactive chemistry, and Chemistry-Transport Models (CTMs) are proposed. The over-arching principle behind the choice of the CCMI simulations is to produce the best possible science.

Figure 1. Participants of the IGAC/SPARC Global Chemistry-Climate Modelling and Evaluation Workshop that was held in Davos, Switzerland, in May 2012.

There are two overall goals for the choice of **REF** simulations:

1. Quantify how well the models can reproduce the past behaviour (climatology, trends and interannual variability) of tropospheric and stratospheric ozone, other oxidants, and more generally chemistry-climate interactions, as well as to understand processes that govern these interactions. This is the rationale behind the "past" transient hindcast reference simulations in either free-running (**REF-C1**) or specified-dynamics (**REF-C1SD**) mode. These simulations are forced by boundary conditions specified from observations or empirical data (*e.g.*, sea surface temperatures (SSTs), sea ice concentrations (SICs), emissions, greenhouse gas (GHG) concentrations) and meteorology in the case of **REF-C1SD**. One of the goals for the new **REF-C1SD** simulation is to provide an improved evaluation against observations, in particular new satellite, ground-based, and *in situ* measurements.

2. Analyse projections of the future evolution of tropospheric and stratospheric ozone. This is the rationale behind the "future" transient reference simulation (**REF-C2**), which is forced by trace gas projections and either prescribed modelled SSTs and SICs, or an interactively coupled ocean. Experience gained from the evaluations performed for the SPARC-CCMVal (2010) report shows that it is important to have a continuous time series from the models, covering both past and future, in order to avoid inhomogeneity in the data sets (in terms of both absolute values and variability), and also that the simulations extend to 2100 in order to fully capture the process of ozone recovery from the effects of ozone-depleting substances (ODSs). Accordingly, **REF-C2** simulations should cover the period 1960-2100, with a 10-year spin-up starting in 1950.

It is recommended that groups perform a small ensemble of simulations covering the 'past' 1960-2010 (**REF-C1**) and 'future' 1960-2100 (**REF-C2**) periods, so as to establish an uncertainty range in the simulations.

The proposed **SEN** simulations are designed to augment the science that can be obtained from the reference simulations. These simulations include investigating the sensitivity to various GHG scenarios, ODSs, and emissions.

The workshop participants recommended the creation of a joint IGAC/SPARC Chemistry-Climate Model Initiative (CCMI).

Further sensitivity simulations that might be proposed to answer specific science questions will be made available on the CCMI website.

All simulations are open to a broad range of participating CCMs, as well as to ESMs with interactive stratospheric and/or tropospheric chemistry. The specific dynamics simulation **REF-C1SD** is designed for CTMs, CCMs or ESMs with the capability of nudging using meteorological input.

All participating models should use the **standard set of specified forcings** that are specified in *Eyring et al.* (2013).

Scientific questions and timelines

While the Coupled Model Intercomparison Project Phase 5 (CMIP5) simulations are now being studied in great detail in support of the IPCC Fifth Assessment Report (AR5), along with analysis of simulations performed under the ACCMIP, Geoengineering Model Intercomparison Project (GeoMIP) and Aerosol Comparisons (AeroCom) activities, the next WMO/UNEP Scientific Assessment of Ozone Depletion should be supported by updated simulations of stratospheric ozone. It is envisaged that the new simulations broadly follow the recommendations of the SPARC-CCMVal (2010) report, in particular:

- CCM simulations of ozone depletion/recovery should be performed seamlessly over the entire 1950-2100 period with consistent forcings, and with data produced in a standard format to allow for multi-model intercomparison.

- A range of different scenarios should be simulated, *e.g.*, using fixed GHG and different GHG projections. To be consistent with CMIP5, these scenarios should generally follow the four Representative Concentration Pathways (RCPs, *Moss et al.* (2010), *van Vuuren et al.* (2011)), but with ODS values replaced with those from WMO (2011). These simulations will allow correct attribution of the projected changes and an understanding of the sensitivity to the GHG scenario employed.

- Development should continue towards comprehensive troposphere-stratosphere CCMs, which include an interactive ocean, tropospheric chemistry, a naturally occurring QBO, spectrally resolved solar irradiance, and a fully resolved stratosphere.

- The next generation of CCMs should also include a better representation of tropospheric chemical processes (*e.g.*, non-methane hydrocarbons, lighting NO_x production, detailed inclusion of dry and wet deposition processes). This is certainly important for science studies in the troposphere and Upper Troposphere Lower Stratosphere (UTLS) region, but may also be important for better representation of the overall climate system.

- The coupling of CCMs to interactive oceans is recommended in the future, in order to make the representation of climate change in the models more physically self-consistent.

- The community should address the issue of how to include very short-lived (VSL) organic bromine species into the boundary conditions and chemical mechanisms of CCMs.

- An accurate knowledge of the atmospheric lifetime of gases is essential for predicting ozone depletion and the climatic effects of emissions. A re-evaluation of the lifetimes of important halogen source gases (*e.g.*, CFC-11, CCl4, halons, HFCs, HCFCs, and related species) is currently underway as part of the SPARC activity on 'Lifetime of halogen source gases' (see http://www.sparc-climate.org/activities/lifetime-halogen-gases/), since evidence has emerged that in many cases the actual lifetimes may be considerably longer than those currently assumed in the 2010 WMO/UNEP Ozone Assessment (WMO, 2011) and in the scenarios used to drive the CCMs. This represents a major uncertainty in reconciling top-down and bottom-up emission estimates, and in model projections.

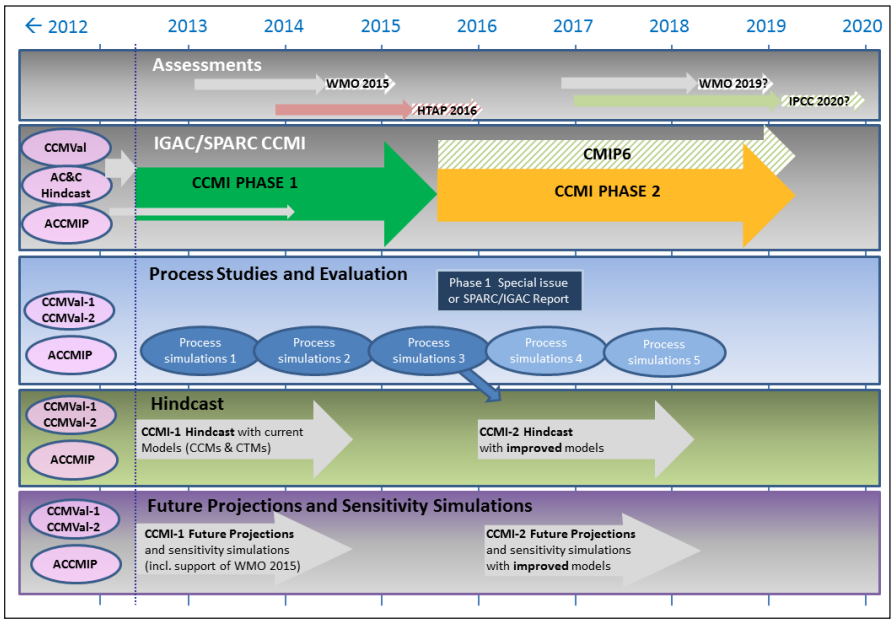


Figure 2. Timeline for the IGAC/SPARC CCMI community simulations.

Some of the above-mentioned points are already considered in existing simulations. For example, a subset of models participating in CMIP5 has interactive chemistry and a coupled ocean. These runs can be included in studies that analyse the ozone evolution under different GHG scenarios. On the other hand, some of the model groups that did not participate in any of the above mentioned model intercomparison projects (MIPs) might want to additionally run simulations that extend the science beyond what was possible for WMO (2011).

In addition, the scientific questions that can be addressed through a new hindcast simulation with models including interactive chemistry are diverse. A non-exhaustive list of questions includes:

(i) How well does the current generation of global chemistry models capture the interannual variability in tropospheric and stratospheric constituents?

(ii) How well do we understand the budget of tropospheric OH? Can we capture the estimated interannual variability and trends?

(iii) How have changes in atmospheric forcings impacted chemical composition and chemistry over the last 30 through 50 years? These forcings include: a) changes in climate forcing with resulting impacts on temperature, water vapour and meteorology, possibly extending to stratosphere-troposphere exchange, b) changes in ozone and aerosol precursor emissions, c) changes in land cover, and d) changes in ODSs.

(iv) How have changes in aerosol loading impacted oxidative capacity of the troposphere over the last 30 to 50 years?

(v) To what extent do the increased satellite retrievals of tropospheric and stratospheric constituents constrain constituent variability over the last 10-15 years?

(vi) To what extent can CCMs forced

with observed SSTs and solar particles capture the observed interannual variability of the hindcast simulations?

(vii) What is the role of very short-lived halogen species (VSLS)?

The proposed hindcast simulations will address these questions through observationally-based simulations and sensitivity tests. Additionally, a re-assessment of temperatures, trace species and ozone in the simulations will allow documenting the progress of individual models and overall progress on the representation of key processes compared to the last CCM assessments. The comparison of CCM results with observations will also allow some groups to identify and correct previously unrecognized model errors and will help to indicate a range of model uncertainties. The hindcast simulations are also incorporated in the work plan of the UNECE/EMEP Task Force Hemispheric Transport (http://iek8wikis.iek.fz-juelich.de/HTAPWiki/WP3.6), focusing on aspects specifically relevant for hemispheric transport of air pollution and its contribution to observed trends of pollution.

Overall, there are two competing timescales for performing these simulations: the shorter term ozone assessment timescale including the need to perform a new hindcast simulation for improved understanding, and the longer term timescale for integrated climate and chemistry assessment for both the troposphere and stratosphere. The CCMI timeline is shown in Figure 2.

Summary and Outlook

CCM groups are encouraged to run the proposed CCMI-1 reference simulations with the specified forcings. In order to facilitate the set-up of the reference simulations, the forcings and other datasets have been made available on the CCMI website (http://www.pa.op.dlr.de/CCMI/) and through the specific links given in this document. The CCMI website has been created to report on ongoing CCMI activities and to serve the needs of the CCM and CTM community. The forcings are made available to encourage consistency of anthropogenic and natural forcings in future model/model and model/observation inter-comparisons. Any updates as well as detailed explanation and further discussion will be placed on the CCMI website. In addition to the reference runs, the groups are encouraged to run as many CCMI-1 sensitivity simulations as possible. The hope is that these additional runs will be available in time to provide useful input for the anticipated 2014 WMO/UNEP Ozone Assessment, so that the ozone projections from the CCMs can be assessed for different GHG scenarios and the fixed ODS simulation. A community-wide workshop will be held from 14-16 May 2013 in Boulder (USA), where initial results from the CCMI-1 simulations will be discussed.

The data will be collected in CF compliant netCDF format at BADC. For the collection of the data, a data policy similar to those used in previous CCMVal and ACCMIP intercomparisons will apply. It is expected that the groups submitting model output to BADC, as well as the wider community who will be working with these data, will disseminate the results of this effort through a series of publications.

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IGAC Americas Working Group Workshop: Setting the Foundation

28-30 January 2013
Bogotá, Colombia

Megan L. Melamed, IGAC IPO, CIRES, University of Colorado, Boulder, CO, USA (megan@igacproject.org)
Karla Longo, CCST, INPE, São Paulo, Brazil (karla.longo@inpe.br)
Olga L. Mayol-Bracero, ITES, University of Puerto Rico, San Juan, Puerto Rico (omayol@ites.upr.edu)
Nestor Rojas, Universidad Nacional de Colombia, Bogotá, Colombia (nyrojasr@unal.edu.co)

In 2010 the IGAC Scientific Steering Committee (SSC) decided to expand its activities to include sponsorship of National/Regional Working Groups. The goal of IGAC National/Regional Working Groups is two-fold; one is to create a strong cohesive community of atmospheric scientists in a specific nation/region that together have a sum larger than their parts, and the second goal is to connect the National/Regional Working Groups to the larger IGAC community to foster international collaboration.

During the annual IGAC SSC meeting in October 2011 in San Juan, Puerto Rico, IGAC SSC members Olga L. Mayol-Bracero from the University of Puerto Rico and Karla Longo from INPE, Brazil suggested that the formation of an IGAC Americas Working Group would be extremely beneficial to the atmospheric science community throughout Latin America. With full support from the IGAC SSC and organizational committee of Olga Mayol-Bracero, Karla Longo, and Megan Melamed (IGAC Executive Officer) began to form the IGAC Americas Working Group.

A year and half later, the first workshop for the IGAC Americas Working Group: Setting the Foundation took place 28-30 January 2013 at the Universidad Nacional de Colombia in Bogotá. The workshop brought together 24 people from 16 different countries across the Americas. The first day of the workshop consisted of introductions from sponsoring organizations including

IGAC, Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS), International Geosphere-Biosphere Programme (IGBP) Brazilian Regional Office, World Meteorological Organization Global Atmospheric Watch Urban Research Meteorology and Environment (WMO-GRUME) project, United National Environmental Program Atmospheric Brown Cloud (UNEP-ABC) project, and Inter-American Institute for Global Change Research (IAI).

Following these presentations, representatives from the 16 different countries were asked to present on the following four questions:

1. *What current research in atmospheric chemistry is being conducted in your country?*

2. *How is scientific research funded in your country?*

3. *What are the institutions and their structure that conduct atmospheric chemistry research in your country?*

4. *What are the scientific needs and questions that need to be addressed in your country?*

Country presentations answering these questions set the foundation for the rest of the workshop.

The workshop resulted in two specific outcomes. First workshop participants are currently writing a perspective piece on "Atmospheric Chemistry: Scientific Needs and Questions in Latin America." The perspective piece will first showcase examples of excellent scientific research that has, or is being, conducted in Latin America before addressing the scientific needs of the atmospheric chemistry community in Latin America and what scientific questions need to be addressed in Latin America. Marcos Andrade (Universidad Mayor de San Andrés, Bolivia) and Rodrigo Jimenez (Universidad Nacional de Colombia, Colombia) are the lead authors on the perspective piece in addition to 8 other co-authors.

The workshop brought together 24 people from 16 different countries across the Americas.

The second outcome of the workshop is the formation of an Implementation Committee that will work over the next year to lay the foundation for the composition and structure of the IGAC Americas Working Group. Nestor Rojas (Universidad Nacional de Colombia, Colombia) is leading the Implementation Committee, which also consists of Karla Longo (INPE, Brazil), Michel Grutter (UNAM, Mexico), Megan Melamed (University of Colorado, USA), Olga Mayol-Bracero (University of Puerto Rico, Puerto Rico), Carlos Rudamas (Universidad de El Salvador, El Salvador), Juan Carlos Antuña (Instituto de Meteorología, Cuba), Luara Dawidowski (CNEA, Argentina), and Marcos Andrade (Universidad Mayor de San Andrés, Bolivia). The Implementation Committee will slowly phase out over the next few years as the IGAC Americas Working Group is formed.

The workshop was a great success and under the guiding principle of providing equal opportunity for all scientists in the Americas, the IGAC Americas Working Group aims to build a cohesive network and foster the next generation of atmospheric scientists with the ultimate goal of contributing to development of a scientific community focused on building collective knowledge in/for the Americas and not only for individuals' welfares.

The workshop was sponsored by Universidad Nacional de Colombia, IGAC, European ACCENT Plus Program, iLEAPs, WMO/GRUME and IGBP. The iCACGP and IAI endorsed the workshop. Corporate sponsors included Ambienciq Ingenieros SAS, Laboratorios Prodycon SA, Apcytel Ltda, K2 Ingeniería SAS, Gesoltec SAS, Insak SAS, Sanambiente SAS, Hotel Embassy Park, Ambar Tech EU, and Biosolutions Ltda.

2012-2016 Work Plan on Hemispheric Transport of Air Pollution

Task Force on Hemispheric Transport of Air Pollution

Terry Keating, US EPA, Washington, DC, USA (keating.terry@epa.gov)

Frank Dentener, European Commission – JRC, Ispra, Italy (frank.dentener@jrc.ec.europa.eu)

Most air pollution problems are due to local or regional emission sources, but the contribution of extra-regional sources and influences can be significant. Policy makers need to understand how much of an air pollution problem is due to emissions sources under their control, how much is beyond their control, and how much might be addressed through international or interjurisdictional cooperation. The Task Force on Hemispheric Transport of Air Pollution (TF HTAP) is a cooperative scientific effort that is working to improve our understanding of the relative role of regional and extra-regional sources of air pollution in different regions across the Northern Hemisphere. In 2010, TF HTAP published the first comprehensive international assessment of intercontinental transport of ozone, aerosols, mercury, and persistent organic pollutants. The TF HTAP is now working to implement a new 2012-2016 work plan to refine our understanding of regional and extra-regional influences and the availability of mitigation measures.

TF HTAP is organized under the auspices of the UNECE Convention on Long-range Transport of Air Pollution (LRTAP Convention), but participation in TF HTAP is open to all interested experts. Since its first meeting in 2005, approximately 800 experts from 38 countries have participated in at least one TF HTAP activity, 14 of those countries are outside the geographic scope of the LRTAP Convention.

TF HTAP's 2012-2016 Work Plan is divided into 6 thematic areas:

- **Theme 1: Emission Inventories and Projections.** Under this theme, TF HTAP is developing a new global emissions mosaic for 2006-2010, piecing together well-accepted emissions inventories developed at the national

or regional scale into a global inventory and filling in the gaps with globally derived estimates (EDGAR). TF HTAP is also developing a series of "benchmark" emission scenarios for 2010-2030 in which varying levels of air pollution control are explicitly represented. Initial results for both the historical and future emissions efforts are expected in March 2013.

- **Theme 2: Source Apportionment and Source/Receptor Analysis.** Under this theme, TF HTAP is organizing a series of multi-model emission perturbation studies for 2006-2010. A proposed set of source regions to be used in these simulations is shown in Figure 1. In addition to conducting these experiments with global atmospheric chemistry models, we are working with several regional model intercomparison studies –the Air Quality Model Evaluation International Initiative (AQMEII) in North America and Europe and the Model Intercomparison Study –Asia (MICS) – with the intent of "nesting" regional simulations inside the global simulations. The ensemble experiments will be used to develop parameterizations of source-receptor relationships that can be used in the evaluation of future policy scenarios. The experiments will also include comparisons of different methods for estimating source-receptor relationships. The experiment specifications are still being discussed, but are expected to be completed at the TF HTAP meeting in March and simulations are expected to get underway as soon as the historical emissions data are available.

- **Theme 3: Model-Observation Evaluation and Process Diagnosis.** The ensemble of 2006-2010 simulations conducted under Theme 2 will be evaluated in comparison to various types of observations, including those from surface networks, aircraft campaigns, and satellite instruments, to better understand how well the models are able to capture and partition the effects of regional and extra-regional influences. Specific sets of analyses or case studies are being organized under this theme around specific types of observations, atmospheric processes, or geographic regions.

- **Theme 4: Assessment of Health, Ecosystem, and Climate Impacts.** Using the results of the Theme 2 simulations and the resulting parameterizations of source-receptor relationships, analyses under this theme will assess the human health, ecosystem, and climate impacts associated with the 2006-2010 simulations as well as 2010-2030 policy scenarios developed under Theme 1. A workshop on the methods to be used in this impact assessment is being planned for late 2013 or early 2014.

- **Theme 5: Assessment of Climate Change Impacts on Pollution.** Previous work has suggested that, in the near term, climate change will have a relatively small effect on the patterns of intercontinental transport, as compared to the effects of expected emissions changes. The TF HTAP is looking to draw insights from climate modeling performed for IPCC AR5 and the ACCMIP and CCMI initiatives to identify robust circulation changes that may alter intercontinental source-receptor relationships.

- **Theme 6: Development of the Data Network and Analysis Tools.** To support the work in Themes 1-5, a network of interconnected data repositories has been developed for modeling, emissions, and observational data of different types. We are developing software tools that are able to access this distributed data network; find, visualize, and retrieve relevant data; and perform standardized analysis tasks.

Under each theme, individual "work packages" and work package leaders have been identified. This structure has been laid out in a wiki format, accessible through www.htap.org, with a main page for each work package to communicate current plans and results and a discussion page for each work package to collect comments and suggestions. As new ideas for cooperative work are identified, new work packages will be added to the plan and the wiki structure.

The 9th annual meeting of the TF HTAP will take place 20-22 March 2013 at WMO Headquarters in Geneva. The meeting will start with a joint session with the WMO's Global Atmospheric Watch 2013 Conference taking place 18-20 March. A main focus of the meeting will be to consider how the existing data management infrastructure for observations, modeling, and emissions information (Theme 6 of the work plan) supports the types of model evaluation questions (Theme 3) that are of interest to TF HTAP and to identify where next investments are needed.

More information about the Geneva meeting and the TF HTAP, in general, is available at www.htap.org.

AMAP Expert Group Workshop on Short-Lived Climate Forcers

26-28 November 2012
Seattle, WA, USA

Patricia Quinn, NOAA PMEL, Seattle, WA, USA (patricia.k.quinn@noaa.gov)

Andreas Stohl, NILU, Kjeller, Norway (ast@nilu.no)

Arctic temperatures have increased at almost twice the global average rate over the past 100 years. Warming of the Arctic has been accompanied by an earlier onset of spring melt, a lengthening of the melt season, and changes in the mass balance of the Greenland Ice Sheet. In 2009, the Arctic Monitoring and Assessment Programme (AMAP) established an Expert Group to assess the role of Short-Lived Climate Forcers (SLCFs) in the rapid melting of the Arctic. The Expert Group was charged with reviewing the state of science surrounding SLCFs in the Arctic and recommending the science tasks that AMAP should conduct or promote to improve the state of knowledge and its application to policy-making. In addition, the Expert Group was charged with providing scientific input for mitigation strategies developed by the Task Force on SLCFs established by the Arctic Council. The first phase of the Expert Group's work focused on black carbon (BC) and co-emitted organic carbon (OC) and resulted in the 2011 publication of an assessment entitled "The Impact of Black Carbon on Arctic Climate" (www.amap.no). The assessment summarized the current understanding of emissions of BC and OC, transport of these species to the Arctic, and their radiative impact in the Arctic and provided recommendations for further research.

Work has now begun on a second assessment to be delivered to AMAP by December of 2014. In this next phase, the climate impacts of tropospheric ozone and all species co-emitted with BC will be included in the analysis. In addition, activities will be coordinated with a second Expert Group recently formed by AMAP to assess impacts of methane on Arctic Climate. The SLCFs Expert Group met in Seattle, WA 26-28 November 2012 to design a work plan for the next two years. Because of the difficulty models have in accurately representing concentrations of BC in the Arctic, considerable effort will be put into measurement-model comparisons of BC distributions within the Arctic. In addition, model simulations, both regional and global, will be conducted to assess radiative forcing by region and source sector of emission. Emissions will be segregated by latitude band, Arctic Council nations (i.e., those countries that have borders in the Arctic), and the Rest of the World while source sectors will include domestic combustion, transport, energy generation, industrial production, waste combustion, agricultural burning, grass and forest fires, and flaring. Additional model simulations will be performed to assess the climate response to baseline emissions as well as several emission reduction scenarios.

Those participating in the Expert Group include Patricia Quinn and Andreas Stohl (co-chairs) and Terje Berntsen, Jesper Christensen, Mark Flanner, Alexei Krivolutsky, Kaarle Kupiainen, Joakim Langner, Kathy Law, Heikki Lihavainen, Julia Schmale, Vladimir Shevchenko, David Simpson, Henrik Skov, Juha-Pekka Tuovinen, Vigdis Vestreng, and Knut von Salzen. The next meeting of the Expert Group will be in Potsdam, Germany in June of 2013.

Highlights from the Better Air Quality 2012 Conference

Asia's Largest Air Quality Management Event

5-7 December, 2012
Hong Kong, China

Sophie Punte, Clean Air Aisa, Pasig, Philippines (sophie.punte@cai-asia.org)

Ritchie (Chee) Anne Roño, Clean Air Aisa, Pasig, Philippines (ritchie.rono@cleanairasia.org)

(This article appears in the February 2013 issue of *EM Magazine*, a publication of the Air & Waste Management Association (A&WMA; http://www.awma.org). To obtain copies and reprints, please contact A&WMA directly at 1-412-232-3444.)

The Better Air Quality conference returned to Hong Kong in December 2012 after ten years. Over 700 participants from almost 40 countries participated in sessions that featured keynote speeches, 112 oral presentations, 37 posters, 9 country roundtables, a panel discussion and transport debate revolving around the theme "Growing Cities, Healthy Cities".

BAQ 2012 was organized by Clean Air Asia, in partnership with Hong Kong's Environmental Protection Department, The Hong Kong Polytechnic University, Asian Development Bank and The World Bank, and was supported by 15 corporate sponsors and 21 other partner organizations. The conference was held in parallel with the Motor Vehicle Emissions Control (MoVE) workshop.

Cities in developing Asia have very unhealthy air

The air in 7 out of 10 cities in developing Asia is still very unhealthy. Particulate matter, a key pollutant associated with mortality and respiratory disease remains well above World Health Organization (WHO) standards and is again on the rise across Asia. With about 120,000 people moving to cities every day and private vehicles and energy use growing exponentially, more and more people will be exposed to air pollution.

"Air quality exceeds safe standards in the vast majority of developing Asian cities with the most recent WHO assessment finding that 1.3 million people worldwide of which over 800,000 in the developing countries of Asia die prematurely each year, an unacceptable toll for a preventable problem with effective solutions", said Robert O'Keefe, Vice President of the Health Effects Institute and Chairman of the Board of Trustees of Clean Air Asia, during his remarks at the opening of the conference.

The air in 7 out of 10 cities in developing Asia is still very unhealthy.

A facilitated discussion of panelists representing government, cities, private sector, development agencies and civil society at the conference delved into how we ensure that our growing cities in Asia remain healthy. Christine Loh, Under Secretary for the Environment, shares that "Hong Kong is better equipped than many developing regions in Asia to combat the problem of air pollution, given its rich resources and knowledge, and would be in a position to help less developed cities in terms of technical know-how and research."

CO_2 emissions outpace economic growth in Asia

CO_2 emissions from road transport rise faster than the Gross Domestic Product, and are expected to double in the next seven years, based on a study covering 13 Asian countries representing 95% of Asia's population and 89% of the region's GDP. Emissions from electricity grow at about the same rate as the GDP and will double in 15 years. Road transport and electricity are major sources of CO_2 emissions in Asia, emitting 5.26 billion tons of CO_2 per year.[1]

"Given the fast growing economies of many Asian countries, easily accessible data on air pollution and greenhouse gas emissions for two high emitting sectors presents a valuable set of indicators to key stakeholders working on development in Asia," said Mary Barton Dock, Director of the World Bank's Climate Policy and Finance Department.

Current transport policies and strategies in the major ASEAN countries fall short to meet the required 2050 per capita transport emission reductions needed to avoid a 2 degree Celsius increase in global temperature.[2] Kazuo Inaba, Director General at the Japan Ministry of Land, Infrastructure, Transport and Tourism highlighted that "to effectively fight climate change there is a need for cooperation and sharing of experi-

ence," and introduced the work of the ASEAN-Japan Transport Partnership as an example of such cooperation.

"Don't adapt to air pollution" campaign launched

A revitalized identity (new name, new logo) for Clean Air Asia strengthens its reputation as an established and credible voice for air quality and climate change in Asia. The new Clean Air Asia brand was launched together with a campaign that highlights the severity of air pollution in Asia.

This grass roots campaign aims to break through the resignation among large groups of the population that air pollution is a fact of life that cannot be changed. "People look at air pollution like the weather. You complain about it but you can't solve it", said Sophie Punte, Executive Director of Clean Air Asia during the launch. "We see that people start wearing masks or buy air filters for their houses and cars, and move away from heavily polluted areas if they can afford it, in short they are adapting to air pollution rather than doing something about it. We see that there is increasing political will in Asia to address air pollution but without broad based popular support such political will cannot succeed".

Clean Air Asia's "don't adapt to air pollution" online campaign consists of a YouTube video and a micro website where people can check pollution levels in their city and select their own nose hair styles.

[1] Accessing Asia: Air Pollution and Greenhouse Gas Emissions Indicators for Road Transport and Electricity. This work is supported by the World Bank Development Grant Facility and the Clean Air Asia Knowledge Partnership. See link: http://cleanairinitiative.org/portal/projects/MeasuringAPandGHGEmissions

[2] The "International Study of Transport Systems in a Low Carbon Society" study was implemented by Clean Air Asia and Institution of Transportation Studies with funding from the Nippon Foundation. See link: http://cleanairinitiative.org/portal/whatwedo/projects/LowCarbonTransportSoutheastAsia

Visit the BAQ website: www.baq2012.org
Visit the Hairy Nose campaign site: http://www.cleanairasia.org/hairynose

Priorities for Asian Countries beyond 2012

Country networks convened to discuss what is needed to improve urban air quality, reduce greenhouse gas emissions and make cities more livable in Asia.

Table 1. Recommended Country Priorities for 2013–2014.

BANGLADESH	• Energy-efficient brick kiln technology • Environmentally sustainable transport system • Emission reduction from industry and power generation
INDIA	• Nonmotorized transport • Establish Clean Air City Network • Introduce a Green Freight India Program
INDONESIA	• Improve the public transport system • Nonmotorized transport • Emissions inventory
MALAYSIA	• Establish an Air Quality Society for Malaysia • Training on sustainable transport and urban air quality management • Improve air quality monitoring, especially $PM_{2.5}$
NEPAL	• Nonmotorized transport • Improve the public transport system • Revamp air quality monitoring stations
PHILIPPINES	• Improve air quality monitoring, especially $PM_{2.5}$ • Establish motor vehicle inspection stations and review guidelines, standards, and testing process • Launch nationwide program on clean air for cities
THAILAND	• Transboundary haze pollution • Clean air for smaller cities • Promote alternative fuel
SRI LANKA	• Improve the countrywide vehicle emissions testing program with proper monitoring and auditing • Strengthen ambient air quality monitoring network • Develop fuel quality roadmap
VIETNAM	• Air pollution control action plan • Air pollution reduction from mobile sources through green freight and fuel economy • Improve air quality monitoring and establish air quality index for seven cities in Vietnam

Inaugural Meeting of the Interdisciplinary and Global Working Group (IG-WG) on Short-Lived Climate-forcing Pollutants

13-15 December 2012
Potsdam, Germany

Julia Schmale, Institute for Advanced Sustainability Studies, Potsdam, Germany (Julia.schmale@iass-potsdam.de)

Jessica Seddon, Okapi Research, Chennai, India (jseddon@okapia.co)

Jason Blackstock, University College of London, London, UK (jason.blackstock@insis.ox.ac.uk)

The Interdisciplinary and Global Working Group on Short-Lived Climate-forcing Pollutants (SLCPs) conducted its inaugural meeting at the Institute for Advanced Sustainability Studies (IASS) in Potsdam, Germany, from 13 to 15 December, 2012. The IG-WG is comprised of young experts from science and social science academic backgrounds, public service, the private sector, and civil society. IG-WG members have direct professional experience in development finance, air quality regulation, air pollution and climate science, science-policy dialogue, urban policy, and other fields for which SLCPs pose important policy challenges. It intends to explore and share knowledge on how emerging initiatives to mitigate climate change through SLCP reduction can be more effectively integrated across policy sectors in the joint context of socio-economic development, improved air quality, and broader climate change policy. Its members share a common commitment to translating knowledge into action in their professional lives and through IG-WG partnerships.

Background

Short-lived climate-forcing pollutants (SLCPs), which establish a strong link between the sectors of air pollution and climate change, have gained much attention outside the science community due to several reports by the UN Environmental Programme and others. This resulted in the formation of initiatives such as the Climate and Clean Air Coalition (CCAC) to reduce SLCPs with focus on black carbon, methane, and HFCs. The UNEP-recommended SLCP mitigation options have the potential to obtain significant political momentum due to co-benefits that occur rapidly and at local and regional scales in the sectors of climate change (an average of 0.6 °C less temperature increase by 2050) and air pollution (about 2.4 million premature deaths could be avoided and roughly 32 million tons of stable crops could be saved annually). However, despite this obvious win-win situation, there are potential trade-offs especially with regard to major air pollutants which need to be considered when aiming for integrated and sustainable policy

approaches, but which are not covered by the current political SLCP framing.

The Workshop

The purpose of the workshop, to which international experts and representatives from SLCP-related initiatives were invited, was to shape IG-WG's work agenda for 2013/2014 by identifying key areas for further exploration of interaction between various policy perspectives and by critically questioning the implications of SLCP reduction strategies for the integration of air pollution and climate change mitigation efforts. Within this context, the workshop provided an overview of the current science and policy of SLCPs, generated insights into SLCP related policy sectors such as urban development and food security, and developed a map of the current global stakeholder community.

Thorough discussions emerged around key issues for making successful integrated policy approaches such as combinations of top down, bottom up, technological and non-technological approaches, involving stakeholders, sector-based versus thematic approaches and educating tomorrow's leadership. The need for action was identified in the areas of knowledge brokering and establishing stronger links between stakeholders, and developing the missing metrics to evaluate the highlighted co-benefits. A list of participants and an overview of the discussions can be downloaded from the link below.

Outlook

Based on the input from the workshop, the IG-WG will broker improved, action-oriented relationships between targeted policy and stakeholder groups that are presently not used to their full potentials. Within this context, the IG-WG will carry out an umbrella project focused on the development and "stress testing" of integrated metrics for air pollution and climate change in collaboration with partners from science and practice. The IG-WG thereby intends to bridge the gap between a scientifically derived metrics output and its application in practice, facilitating iterative information exchange and feedback in both directions. This focus intends to link closely to and follow up with the current IGBP/IGAC Air Pollution & Climate Initiative, which is developing a framework for integrated programs on air pollution and climate change.

The IG-WG is hosted by the ClimPol Project at the Institute for Advanced Sustainability Studies e.V., Potsdam, Germany.

Link:
http://climpol.iass-potsdam.de/about/interdisciplinary-and-global-working-group

HALO European Workshop on the Tropospheric Oxidation Capacity (TOXCA)

16-18 January 2013
Bremen, Germany

Maria Dolores Andrés Hernández, IUP, University of Bremen, Germany (lola@iup.physik.uni-bremen.de)

From January 16-18, 2013, 30 scientists from France, UK, Switzerland and Germany gathered at the Institute for Environmental Physics of the University of Bremen in Germany to discuss about the tropospheric oxidation capacity in the framework of the Priority Program of the DFG (Deutsche Forschungsgemeinschaft) HALO (High Altitude and Long Range Research Aircraft). Results from ground to airborne experiments were used to revise the state of the art in observing and modelling oxidising species, and to identify key scientific issues that could benefit from further measurements on the HALO platform. The workshop comprised of four sessions: (a) Oxidative capacity: from ground based to airborne measurements, (b) Airborne measurements: state of art and key open issues, (c) Why are airborne measurements still crucially required?, and (d) Linking modelling with measurements.

The oxidising capacity of the troposphere (defined as the total burden of O_3, OH, HO_2, H_2O_2 and NO_3) is responsible for removing most trace gases emitted from the atmosphere. Critical aspects of the oxidising capacity were discussed on the basis of

results from different European and international projects (MEGAPOLI, HOOVER, POLARCAT, ACCESS2012, ICARTT, OP3, RONOCO, SHIVA and ESMVal). Recent investigations of tropospheric chemistry using a wide variety of European airborne facilities (large, small and unmanned) were presented. Future cooperation possibilities will be explored, in particular between OMO-EU and CharMex in summer 2013.

Several scientific and operational issues were highlighted within TOXCA:

a) Models and observations for OH differ locally and globally. This may involve instrumental issues or incomplete chemical understanding. Following aspects require further research:

- OH regeneration mechanisms form isoprene peroxy radicals: Large uncertainties exist in the modelling of HO_x in high BVOC, low NO_x environments. Recent chamber experiments indicate the potential of mechanisms from isoprene peroxy radical rearrangements and adjusted reaction rates which may explain the missing OH.

- Oxidising capacity at ultra low NO_x conditions: Unknown oxidizers might explain the photostationary state calculations constraint to measurements.

- Revision of photolysis rates in relation to the T-dependence of quantum yields (e.g. acetone).

- Unimolecular decomposition of Criegee radicals: observations suggest their significant contribution to OH formation

b) The Arctic troposphere will be critically affected by the increase in emissions from petroleum and shipping activities related to the climatic unlocking of the Arctic Ocean.

c) Elevated OH and NO mixing ratios above 10 km over Europe have been associated with summer convective storms. The overall effect of convective clouds in relation to the lifting of NO and HO_x radical precursors, and to the potential "above-cloud" enhancement and "below-cloud" inhibition of photo-oxidative processes due to reflection of UV requires further investigation. Multi aircraft flights may facilitate the characterisation of inflows and outflows of the air mass impacted.

d) Summer NO_y/NO ratios measured in the UT over Europe indicate aged air of unknown origin.

e) Secondary aerosol formation from photochemical aging and its climatic impact are still poorly understood.

f) Knowledge of vertical gradients of organic radicals and their precursors is very limited. IAGOS-CARIBIC provides a large airborne in situ data set of acetone that significantly contributes to the total HO_x production at the tropopause.

g) NO_2 flux calculations of anthropogenic point sources and NO_2 mapping with <100m resolution are possible with airborne imaging DOAS.

h) Exploration of plume aging by Lagrangian experiments requires reliable plume tagging and path-finders. This is particularly important for determining the impact of megacities and large conurbation areas.

i) Linking observational and modelling communities within the planning phase of airborne campaigns improve the ultimate usefulness of the data. Trajectory forecasts, Lagrangian photochemical, particle dispersion and chemical transport models provide crucial information. Model-model and instrumental comparisons are essential.

The TOXCA community made recommendations to improve the outputs of airborne missions investigating the oxidation capacity of the troposphere (http://www.iup.uni-bremen.de/tropopshere/toxca/index.html).

IGAC Community

Join the IGAC Community
Don't forget to join the IGAC community by going to http://eepurl.com/eu3U6.

IGAC Project Offices
International Project Office
University of Colorado, CIRES
Boulder, CO USA
Megan L. Melamed
IGAC Executive Officer
megan@igacproject.org

European Project Office
Italian National Research Council, Institute of Atmospheric Sciences and Climate
Bologna, Italy
Francesca Pollini
igac.bologna@isac.cnr.it

IGAC SSC Members
Paul S. Monks (Co-Chair)
University of Leicester
Department of Chemistry
Leicester, U.K.
P.S.Monks@leicester.ac.uk

Allen Goldstein (Co-Chair)
University of California, Berkeley
Department of Environmental Science, Policy, and Management
Berkeley, California, USA
ahg@berkeley.edu

Jonathan Abbatt
University of Toronto
Department of Chemistry
Toronto, ON Canada
jabbatt@chem.utoronto.ca

Mary Barth
NCAR
Earth System Laboratory
Boulder, Colorado, USA
barthm@ucar.edu

Claire Granier
LATMOS-IPSL
Paris, France
NOAA/ERSL & CU/CIRES
Boulder, CO USA
Max Plank Institute
Hamburg, Germany
Claire.Granier@latmos.ipsl.fr

Colette Heald
Massachusetts Institute of Technology
Department of Civil and Environmental Engineering, Department of Earth, Atmospheric, and Planetary Sciences
Boston, Massachusetts, USA
heald@mit.edu

Melita Keywood
CSIRO and Bureau of Meteorology
Centre for Australian Weather and Climate Research
Melbourne, Australia
Melita.Keywood@csiro.au

Mark Lawrence
Institute for Advanced Sustainability Studies (IASS)
Sustainable Interactions with the Atmosphere
Potsdam, Germany
mark.lawrence@iass-potsdam.de

Karla Longo
Brazilian National Institute for Space Research (INPE)
Center for Earth System Science (CCST)
São José dos Campos, SP, Brazil
karla.longo@inpe.br

Shih-Chun Candice Lung
Academia Sinica
Research Center for Environmental Changes
Taipei, Taiwan
sclung@rcec.sinica.edu.tw

Olga Mayol-Bracero
University of Puerto Rico
Institute for Tropical Ecosystem Studies
Rio Piedras, Puerto Rico
omayol@ites.upr.edu

Spyros Pandis
University of Patras
Department of Chemical Engineering
Patras, Greece
Carnegie Mellon University
Department of Chemical Engineering
Pittsburgh, PA USA
spyros@chemeng.upatras.gr

Rokjin Park
Seoul National University
School of Earth and Environmental Sciences
Seoul, South Korea
rjpark@snu.ac.kr

Kobus Pienaar
North-West University
Potchefstroom, South Africa
Kobus.Pienaar@nwu.ac.za

Yinon Rudich
Weizmann Institute
Department of Environmental Sciences
Rehovot, Israel
Yinon.Rudich@weizmann.ac.il

Chhemendra Sharma
National Physical Laboratory
Radio and Atmospheric Sciences Division
New Delhi, India
csharma@mail.nplindia.ernet.in

Hiroshi Tanimoto
National Institute for Environmental Studies
Center for Global Environmental Research
Tsukuba, Ibaraki Japan
tanimoto@nies.go.jp

Tao Wang
Hong Kong Polytechnic University
Department of Civil and Environmental Engineering
Hong Kong, China
cetwang@polyu.edu.hk

Tong Zhu (*Ex-oficio*)
Peking University
College for Environmental Sciences and Engineering
Beijing, China
tzhu@pku.edu.cn

CALENDAR

Visit igacproject.org for updates to the calendar

May

International Workshop on Changing Chemistry in Changing Climate (C4): Monsoon Focus
1-3 May 2013
Pune, India

The 6th International GEOS-Chem Meeting (IGC6)
6-9 May 2013
Boston, MA, USA

SPARC/IGAC Chemistry Climate Model Initiative (CCMI) Workshop
13-17 May 2013
Boulder, CO, USA

The First Sino-European School on Atmospheric Chemistry (SESAC)
17-27 May 2013
Taicang, China

2013 PASI Short Course for Early Career Scientists
27 May – 7 June 2013
Cartagena, Colombia

June

12th International Conference on Atmospheric Sciences and Application to Air Quality (ASAAQ)
3-5 June 2013
Seoul, Korea

Extreme Weather and Climate Events in the Southern Caucasus - Black Sea Region Conference
3-7 June 2013
Tbilisi, Georgia

AGU Champan Conference
8-13 June 2013
Granby, CO, USA

Workshop on Atmospheric Composition and the Asian Summer Monsoon (ACAM)
9-12 June 2013
Kathmandu, Nepal

July

DACA-13
8-12 July 2013
Davos, Switzerland
Gordon Research Conference
July 28 – 2 August 2013
West Dover, VT, USA

August

Colombian Conference and International Meeting on Air Quality and Public Health
13-16 August 2013
Bogotá, Colombia
www.casap2013.com

Goldschmidt2013- Theme 15
25-30 August 2013
Conference
Florence, Italy
goldschmidt.info/2013/

33rd NATO/SPS International Technical Meeting (ITM) on Air Pollution Modeling and Its Applications
26-30 August 2013
Miami, FL, US
http://www.int-tech-mtng.org/ITM33/index.html

September

Capacity Building Workshop on Modeling of Regional Climate and Air Quality for West Africa
September 2013
Abidjan, Cote d'Ivoire

November

IGBP/ IGAC Air Pollution & Climate Initiative Workshop
5-7 November 2013
Boulder, CO

Italics: IGAC Sponsored Event

Workshop on Atmospheric Composition and the Asian Summer Monsoon (ACAM)

Dates: June 9-12, 2013, **Location:** Kathmandu, Nepal

The Asian summer monsoon (ASM) system has a significant role in chemistry-climate interactions. To date, research focused on the interaction between atmospheric composition and the Asian summer monsoon has largely capitalized on satellite observations and the use of global models. However, how source regions and impact levels are coupled with the topography and dynamics/meteorology is not well understood. Experimental study in the region is extremely challenging. Improving collaborative effort across the international community is essential. This workshop is planned to facilitate international collaborations in areas of scientific research on coupling of ASM dynamics with regional emissions, air quality, aerosol- clouds, impact of convection on tropospheric chemistry, role of upper level anticyclone in water vapor and pollution transport into stratosphere.

For registration, abstract submission, or mailing list subscription :
http://www.acd.ucar.edu/utls/2013/

Sponsors:

ICIMOD (www.icimod.org)
iLEAPS (www.ileaps.org)
IGAC (www.igacproject.org)
SPARC (www.sparc-climate.org)
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Scientific Organizing Committee:

Jim Crawford (co-chair, NASA Langley, USA)
Laura Pan (co-chair, NCAR, USA)
Arnico Panday (LOC chair, ICIMOD, Nepal)
Brice Barret (CNRS, France)
Jianchun Bian (IAP/CAS, China)
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Hans Schlager (DLR, Germany)
Hanwant Singh (NASA Ames, USA)
Hiroshi Tanimoto (NIES, Japan)
Larry Thomason (NASA Langley, USA)

The Abdus Salam International Centre for Theoretical Physics
www.ictp.it

International Workshop on
EXTREME WEATHER AND CLIMATE EVENTS IN THE SOUTHERN CAUCASUS-BLACK SEA REGION

3 - 7 June 2013 - Tblisi, Georgia

Co-sponsored by
Ilia State University and International Global Atmospheric Chemistry

The workshop will take place at Ilia State University, Tbilisi, Georgia (http://www.iliauni.edu.ge). This is an international workshop dedicated to the effects of climate change and unsustainable development in the Southern Caucasus - Black Sea region.

Primary purposes:

- Provide a venue for the discussion of science issues and advancements related to modeling, detection, and forecasting of extreme weather events and regional air quality

- Facilitate the knowledge and experience sharing between foreign and local meteorologists, climate modelers, health experts, representatives of social sciences and humanities, and governmental and non-governmental organizations

- Rank the difficulty / feasibility of resolving different issues using existing modeling approaches, measurement, and remote sensing techniques

- Identify future strategies for improved forecasting of extreme weather events and regional air quality in the Southern Caucasus region

Participation:
The workshop will be conducted in English. Limited funding (including travel grants) for participation is available for scientists from Eastern and Southern European and Middle-Eastern developing nations.
No registration fee is required.

How to apply for Participation:
Applications are to be submitted online through the activity webpage:
http://agenda.ictp.it/smr.php?2510
Please send all file attachments in PDF format.

Contact Information:

Phone: +39 040 2240 374 **Fax:** +39 040 2240 449 **E-mail:** smr2510@ictp.it

ORGANIZERS

Nicholas Meskhidze
NC State University, USA

Mariam Elizbarashvili
Ilia State University, Georgia

Fabien Solmon
ICTP, Italy

INVITED KEYNOTE SPEAKERS

Alexander Baklanov
Danish Meteorological Institute, Denmark
Constanta Boroneant
Centre for Climate Change (C3), Spain
Ines Grigorescu
Institute of Geography, Romanian Academy (IGAR), Romania
Christina Hakopian
Yerevan State University, Armenia
Ilan Koren
Weizmann Institute, Israel
Nato Kutaladze
National Environmental Agency, Georgia
Lia Megrelidze
National Environmental Agency, Georgia
Nina Nikolova
Sofia University, Bulgaria
Markus Petters
North Carolina State University, USA
Yinon Rudich
Weizmann Institute, Israel
Serhat Sensoy
VP of WMO Commission for Climatology Structure, Turkish Meteorological Service
Trahel Vardanian
Yerevan State University, Armenia

DEADLINE

15 APRIL 2013


International Workshop on –
'CHANGING CHEMISTRY IN CHANGING CLIMATE : MONSOON (C4)'
1st - 3rd May 2013
VENUE: Indian Institute of Tropical Meteorology, Pune
Scientific Themes of C4-Workshop
(1st - 3rd May 2013):
1. History of Monsoon research and atmospheric chemistry in sub-continent region.
2. Linkages of Atmospheric chemistry, Climate Change and Asian Monsoon
3. Air pollution and Climate Change impacts on Human health
4. Current and Emerging topics: Air Pollution and Extreme events; Biomass Burning, Atmospheric Brown Cloud.
5. Key opportunities and major challenges in prediction and Predictability of Air Quality.
6. Stratosphere Troposphere Exchange, Brewer Dobson Circulation, Tropical tropospheric and stratospheric Ozone.
7. Future needs
The workshop welcomes paper presentation (Oral and Posters) on these themes from any interested participants willing to present their papers during the meeting.
About the Workshop
➢The main idea is to provide opportunities to scientists from all over the world to present their work in the field of Atmospheric Chemistry, Asian Monsoon, Climate Change and Health Impacts of Air Pollution and to discuss the role of Atmospheric chemistry in Climate Change.
➢ Includes talks by eminent keynote speakers, oral presentations by selected young researchers and poster sessions along with interaction between expert speakers and budding scientists
C4-FOCUS
To address regional burning issues of atmospheric chemistry and its linkages with Climate Change and Asian Monsoon.
Important Dates:
Registration: Open
Deadline for Abstract Submission: 15th March, 2013
Deadline for Application for Partial Travel Support: 15th March, 2013
Communication of Acceptance of Abstract and Grant: 25th March, 2013
Workshop Details:
Venue: IITM, Pune, India
Website: http://www.tropmet.res.in/c4/
E-mail: c4@tropmet.res.in
Fax: +91-20-2586-5142, Phone: +91-20-25904212


SPARC General Assembly 2014
12-17 January 2014
Queenstown, New Zealand
www.sparc2014.org


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