2010-2011 Annual Report
International Global Atmospheric Chemistry Project
NASA Award #NNX09AQ95G

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1 Participants

The International Global Atmospheric Chemistry (IGAC) Project's Core Project Office is located at the National Oceanic and Atmospheric Administration/University of Washington Joint Institute for the Study of the Atmosphere and Ocean (JISAO) in Seattle, Washington. The IGAC Core Project Office is funded equally by the U.S. National Science Foundation (NSF), NOAA, and the National Aeronautics and Space Administration (NASA). Under NASA Award #NNX09AQ95G three different employees have been supported within the IGAC Core Project Office. From June 2010 to January 2011 Sarah J. Doherty was working 75% time as the IGAC Executive Officer, 25% time on research. In January 2011, Sarah J. Doherty stepped down and was replaced by Megan L. Melamed who currently works 100% time as the IGAC Executive Officer. The Award also provides support for Collen Marquist who works 30% time as the IGAC Administrative Specialist.

However, there is a much wider participation in the IGAC project than just those whose pay is covered under this grant. The project activities are guided and, in many cases, implemented by an international Scientific Steering Committee (SSC), which acts on a volunteer basis. The current IGAC SSC members are listed below.

Table 1: IGAC SSC Members 2011

Name	Country	Institute
Monks, Paul (co-chair)	UK	University of Leicester
Zhu, Tong (co-chair)	China	Peking University
Barth, Mary	USA	National Center for Atmospheric Research (NCAR)
Beig[1], Gufran	India	Indian Institute of Tropical Meteorology (IITM)
Drummond[1], James	Canada	Dalhousie University
Facchini[1], Cristina	Italy	Institute of Atmospheric Sciences and Climate
Feingold, Graham	USA	NOAA
Goldstein, Allen	USA	University of Berkeley
Granier[2], Claire	France	Laboratoire Atmosphéres, Milieux, Observations Spatiales
Keywood, Melita	Australia	Common Wealth Scientific and Industrial Research Organization
Konare, Abdourahamane	Côte d'Ivoire	University of Cocody Abidjan
Kondo[1], Yutaka	Japan	University of Tokyo
Lawrence, Mark	Germany	Max Planck Institute for Chemistry
Longo, Karla	Brazil	National Institute for Space Research
Lung[2], Shih-Chun Candice	Taiwan	Academia Sinica
Mayol-Bracero, Olga	Puerto Rice	University of Puerto Rico
Park, Rokin	South Korea	Seoul National University
Pienaar, Kobus	South Africa	North-West University
Rudich[2], Yinon	Israel	Weizmann Institute of Science

[1] These members will rotate off as of 31 December 2011
[2] These members are new as of 1 January 2011

In addition to SSC members, IGAC relies on the involvement of the entire international atmospheric chemistry community in order to carry out its activities. Leads of current IGAC activities (described under Activities and Findings) are listed below:

Table 2: International Leaders of IGAC Activities

Activity	Name	Country	Institute
AC&C	Phil Rasch	USA	Pacific Northwest National Laboratory (PNNL)
	Martyn Chipperfield	UK	University of Leeds
AC&C Bounding BC Report	Tami Bond	USA	University of Illinois
	Sarah Doherty	USA	University of Washington
	David Fahey	USA	NOAA
	Piers Forster	UK	University of Leeds
AC&C MIP	Drew Shindell	USA	NASA-GISS
	Jean-Francois Lamarque	USA	NCAR
AC&C Hindcasts	Peter Hess	USA	Cornell University
AC&C Vertical Distributions	Céline Mari	France	National Center for Scientific Research (CNRS)
	Mary Barth	*USA*	*NCAR*
ACPC	*Graham Feingold*	*USA*	*NOAA*
Megacities Assessment	*Tong Zhu*	*China*	*Peking University*
Air Pollution & Climate	*Paul Monks*	*UK*	*University of Leicester*
	Kathy Law	France	CNRS
	Terry Keating	USA	Environmental Protection Agency (EPA)
	Denise Mauzerall	USA	Princeton University
	Nadine Unger	USA	Yale University
Atmospheric Chemistry & Health	*Shi-Shun Candice Lung*	Taiwan	Academia Sinica
	Gufran Beig	*India*	*IITM*
	Tong Zhu	*China*	*Peking University*
AICI	Eric Wolff	UK	British Antarctic Survey
	Paul Shepson	USA	Perdue University
ITCT-POLARCAT	Kathy Law	France	CNRS
	Andreas Stohl	Norway	Norwegian Institute for Air Research (NILU)
AMMA-AC	Céline Marie	France	CNRS
	Abdourahame Konaré	*Côte d'Ivoire*	*University of Cocody Abidjan*
Megacities-Asia	*Tong Zhu*	*China*	*Peking University*
	Yutaka Kondo	*Japan*	*University of Tokyo*
	Young J. Kim	Korea	Kwangju Institute of Science & Technology
DEBITS	*Kobus Pienaar*	*South Africa*	*North-West University*
China Working Group	*Tong Zhu*	*China*	*Peking University*
North Africa Working Group	*Abdourahame Konaré*	*Côte d'Ivoire*	*University of Cocody Abidjan*

Current IGAC SSC members are in italics

2 Activities and Findings

IGAC is jointly sponsored by the International Geosphere-Biosphere Programme (IGBP) and the international Commission on Atmospheric Chemistry and Global Pollution (iCACGP) of the International Association of Meteorology and Atmospheric Sciences (IAMAS). IGACs mission is to promote and facilitate international atmospheric chemistry research that addresses societal needs in order to achieve global sustainability. IGAC activities are conducted through the Core Project Office under the guidance of a 19 member international Scientific Steering Committee and IGACs parent organizations IGBP and CACGP. IGAC carries out its activities via five main pathways:

1. **Leading scientific initiatives:** The SSC identifies areas within atmospheric chemistry research that need to be addressed and promotes and facilitates international atmospheric chemistry research in the identified areas.

2. **Endorsing scientific tasks:** Scientific tasks are research activities with a specific set of goals that can be achieved in a 3-4 year timeframe. The international atmospheric chemistry community can propose tasks to the IGAC SSC. The proposed tasks are reviewed and endorsed annually and on an as-needed basis by the IGAC SSC.

3. **Sponsorship of national/regional working groups:** IGAC sponsors national/regional working groups that aim to facilitate the coordination of research both within the nation/region and between the nation/region and the international atmospheric chemistry community.
4. **Co-sponsorship of workshops:** IGAC co-sponsors focused workshops on specialty topics that typically produce a tangible outcome, such as a journal publication(s) or research plan(s).
5. **Communications/Networking:** This covers a myriad of activities, including biennial conferences, a newsletter (mail to 3500 researchers around the world), webpage, and miscellaneous networking activities conducted throughout the year.

Here we present the current status of IGAC activities.

Initiatives

- Atmospheric Chemistry & Climate (AC&C)
  Jointly sponsored with WCRP-SPARC
  The AC&C initiative seeks to improve the representation of chemistry/climate interactions in models. After a initially slow beginning, AC&C is now a very active initiative. There are currently four efforts occurring within AC&C:
  - Bounding the Role of Black Carbon in Climate
    This focussed effort is to produce an assessment report that summarizes the most current knowledge on black carbon (BC) and its role in climate as well as provide a best estimate and uncertainty range for the radiative forcing by BC. The report discusses BC emissions/sources, concentrations, microphysical and optical properties, climate forcing mechanisms, reconciling different forcing estimates, and discussion of the mitigation potential for BC-rich sources. Critically, it also includes an estimate of the total forcing due to BC and co-emitted species from BC-rich sources. This effort results from a request for such an assessment by national and international groups trying to formulate policies to mitigate short-term climate warming. It is also expected to constitute a direct input to the next IPCC Assessment (AR5), and has been structured to accommodate the IPCC framework. The report is in the final editing stages and will be submitted to a peer-reviewed journal by June 2011.
  - AC&C Model Intercomparison Project (ACC-MIP)
    Is providing extensive coordinated model simulations, diagnostics, and evaluations of the effect of short-lived species on climate, in coordination with the climate model intercomparison effort (CMIP). The main focus is on the role of tropospheric ozone and aerosols, which both have substantial climate forcing that varies widely in space and time. The first set of model runs for ACC-MIP were completed this past year and a first workshop (see below) was held in April 2011 in Toulouse, France. The model evaluation is expected to be completed in time to support the International Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5). Visit `http://www.giss.nasa.gov/projects/accmip/` for more information.
  - AC&C Hindcast
    This modeling effort is looking into the past in order to determine how well models are able to accurately represent critical chemistry-climate interactions of the past 20 to 25 years. This will help determine key controlling processes and provide confidence in the near-term climate and regional air quality forecasts. This effort focuses on inert tracers (CFCs and N_2O), aerosols, tropospheric ozone, and methane. A post-doc has been hired at Cornell University specifically to focus on the coordination and joint analysis of model runs for this activity, which was also discussed at the ACC-MIP workshop in April 2011 in Toulouse (see below).
  - AC&C Vertical Distributions
    Previous model comparisons show there are large uncertainties in the vertical distribution of trace gases, even when the same emissions are used. This effort focuses on a model intercomparison project to better understand convection and scavenging processes that drive the

vertical distribution of trace gas species. An important component of the model intercomparison will be comparisons with observations from the 2012 Southeast Asia Composition, Cloud, Climate Coupling Regional Study (SEAC4RS) funded through NASA and NSF.

- Aerosols, Clouds, Precipitation, & Climate (ACPC)
  Jointly sponsored with IGBP-iLEAPS and WCRP-GEWEX
  IGAC SSC member Graham Feingold is now co-chair of the ACPC initiative. The goal of this initiative is to obtain quantitative understanding of the interactions between aerosols, clouds and precipitation, and their role in the climate system. With the ACPC Science Plan now published (`http://igac.jisao.washington.edu/CurrentProjects/ACPCSciPlan.pdf`), efforts are underway to plan a field campaign in Brazil in 2014. This will leverage a year long effort by the U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) entitled "MegaCity Outow in the Tropics". In addition, a new component of ACPC is the SAT-ACPC effort, which seeks to address specifically how satellite-based measurements can be used to improve the understanding of the role of aerosols in precipitations processes.

- Assessment of Atmospheric Chemistry in Megacities
  Jointly Sponsored by the World Meteorological Organization
  This initiative seeks to assess the current knowledge of atmospheric chemistry in megacities in Africa, Asia, South America, North America, and Europe. The assessment will also summarizes past and current research projects on this topic such as MEGAPOLI, CityZen, ICARTT, CalNex, and MILAGRO. Finally the report will identify knowledge gaps on atmospheric chemistry in megacities. The writing of this report was a major effort of the past two years and it is now nearly complete. WMO has agreed to print and distribute the book (likely summer 2011).

- Air Pollution & Climate: A Science-Policy Dialogue
  An IGBP Synthesis Topic
  As part of its second phase synthesis activities, the IGBP has identified several key areas which cut across research in its own core projects and which also reach out beyond IGBP with the aim of exploring future crossdisciplinary research needs. The IGBP Air Pollution & Climate initiative, lead by IGAC, seeks to open a science-policy dialogue in order to examine the multiple implications (climate, human health, ecosystems, and food and water security) of existing and proposed mitigation policies that address air pollution and climate change in the near and long-term. The key objectives of this initiative are:

  - Synthesis for policy makers on current state of knowledge on the role and interactions between air pollutants and climate change, including an assessment of uncertainties and identification of gaps.
  - Explore and quantify possible mitigation options within socio-economic and scientific context.
  - In partnership between policy makers and scientists, assess and develop new metrics to quantify co-benefits/trade-offs of past and future pollutant reduction strategies from different emission sources on air quality, human health, climate, ecosystems, and food and water security (within the context of natural changes in the Earth system).
  - Build a new multi-disciplinary research programme to tackle cross cutting issues across traditional science-policy boundaries.

  This activity was first proposed to the IGBP in 2010 and the first planning workshop will be held June 2011 in Arona, Italy following the Task Force on Hemispheric Transport of Air Pollution (TF-HTAP, `http://www.htap.org/`) meeting.

- Atmospheric Chemistry & Health (AC&H)
  The AC&H initiative is a new initiative approved by the IGAC SSC during its annual meeting in July 2010. The initiative seeks to identify:

  - The key scientific questions at the interface of atmospheric chemistry and air pollution health effects;

  - The key areas in which integrated research is needed;
  - The benefits for scientific research and policy that would accrue from dealing with air pollution and atmospheric chemistry in an integrated manner.

  This activity was initiated during the IGAC SSC meeting in 2010. The first planning workshop will be held October 2011 in Boston, MA USA at the Health Effects Institute (HEI).

- IGAC is exploring the need for an initiative on Fundamentals of Atmospheric Chemistry with the goal of stressing importance of continued research in the fundamentals of atmospheric chemistry, i.e. kinetic rate constants, spectroscopy, etc., and the involvement of young scientists in this research.
- IGAC is working to develop an Emissions initiative that would provide an umbrella to already existing and future emissions efforts to ensure that each effort is uniquely defined and not overlapping as well as to integrate the efforts at an international level. Currently, the Emissions Initiative is working with two existing emission inventories efforts; the Global Emissions Inventory Activity (GEIA) and the Community Initiative for Emissions Research and Applications (CIERA). GEIA seeks to develop and distribute inventories of global gas and aerosol emissions from natural and anthropogenic sources (`http://www.geiacenter.org/`). CIERA is building an international community to catalyze emission research by facilitating the consistent, timely, and transparent development of emissions inventories at all scales, evaluations and analyses of emission datasets, and the exchange and communication of emissions information (`http://ciera-air.org/`). A formal proposal to the IGAC SSC is expected fall 2011 and will likely be discussed at the IGAC SSC meeting October 2011 in Puerto Rico.

IGAC Tasks

- Air-Ice Chemical Interactions (AICI)
  Jointly sponsored by SOLAS
  The AICI task will be coming to an end summer 2011 following its final workshop at Columbia University June 2011. The AICI task has been an very successful IGAC activity that has provided import information on the full range of processes and trace gases that are exchanged at the air/ice and snow/ice interface and how they related to atmospheric chemistry and climate. This task has resulted in various publications, including a Special Issue in Atmospheric Chemistry and Physics (`http://www.atmos-chem-phys.net/special_issue80.html`).
- Intercontinental Transport and Chemical Transformation (ITCT) Tasks
  Over the years, IGAC has endorsed a series of research campaigns on intercontinental transport and chemical transformation. These tasks have included three campaigns on aerosol characterization experiments (ACE-1, ACE-2, and ACE-Asia), ITCT-Lagrangian-2k4 experiment that was part of ICARTT, and most recently, the Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models, of Climate Chemistry, Aerosols, and Transport (POLARCAT). These series of tasks are also coming to a close as soon as the final manuscripts on POLARCAT are published.
- African Monsoon Multidisciplinary Analysis - Atmospheric Chemistry (AMMA-AC)
  AMMA is an international project launched in 2002 to improve knowledge and understanding of the West African Monsoon, its variability, and its impact on West African nations. The AMMA-AC task is lead by IGAC SSC member Abdourahamane Konare. Phase 1 of AMMA came to a completion at the beginning of 2010. AMMA-AC during Phase 1 focused on the development of measurement networks of trace gases and aerosols throughout West Africa. During Phase 2, 2010-2020, AMMA-AC will continue to expand the West Africa measurement network in order to provide critical information to the overall AMMA Phase 2 key research themes: (1) interactions between society, environment, and climate (2) study of the predictability and improvement of meteorological, seasonal, and climate forecasting and (3) continued effort to enrich knowledge of the monsoon system.

- Mega-cities: Asia
  The initial goal of this task was to facilitate better coordination between groups making measurements of aerosols and oxidants in and around large cities in Asia. This was accomplished by maintaing a centralized webpage (`http://noysun1.atmos.rcast.u-tokyo.ac.jp/IGAC_Megacities_Asia/index.html`), holding workshop to increase communication between research groups, organizing instrument intercomparisons, and faciliating collaborative publications. This past year has been spent synthesizing the measurements from the various groups and summarizing the results in the Asia chapter of the Assessment of Atmospheric Chemistry in Megacities.
- Deposition of Biogeochemically Important Trace Species (DEBITS)
  DEBITS is lead by IGAC SSC member Kobus Pienaar and also is now in DEBITS Phase II. Phase I of DEBITS focused on the development of an international measurement network of station to monitor the wet and dry deposition of biogeochemically important trace species. Due to Phase I, DEBITS stations all of the highest data quality and assurance and follow the GAW data quality objectives. In Phase II, DEBITS science community plans to adopt a twofold approach to maintain the present operational structure of DEBITS and to support a new integrated approach within the global scientific context of IGBP.

National/Regional Working Groups

The IGAC SSC decided during its annual meeting July 2010 to expand its activities to include the sponsorship of National/Regional Working Groups.

- China Working Group
  The IGAC SSC recently approved the application for an IGAC China Working Group. The IGAC China WG is lead by IGAC SSC co-chair Tong Zhu and aims to:
  - Encourage participation of Chinese atmospheric scientists to engage their leadership in international atmospheric chemistry research programs;
  - Strengthen ties with IGAC to facilitate the implementation of IGAC related research projects and tasks in China;
  - Provide advice or consultation on major research plans in atmospheric chemistry in China to promote funding support;
  - Promote academic exchange on atmospheric research in China and internationally, especially with IGBP China Working Groups; and
  - Provide a platform in China to facilitate the academic growth and development of young researchers in atmospheric chemistry.
- North Africa Working Group
  A North Africa working group has been discussed. However, the formalization has been put on hold due to the current unrest in Côte D'Ivoire, where the leadership of this working group is located.

Workshops

IGAC has co-sponsored the following workshops in 2010-2011

- 13-15 April 2010, Megacities and Coastal Zones IGBP Fast Track Initiative (FTI) workshop
  This FTI is a joint activity of SOLAS, IGAC and LOICZ which specifically looked at how atmospheric chemistry in coastal urban areas affects and is affected by interactions with the coastal marine environment. A report from the workshop is in preparation and will constitute a contribution to the wider Megacities and Coastal Zone IGBP Synthesis.

- 19-21 May 2010, AMMA-Africa meeting, Abidjan, Cte dIvoire
  With the intensive field phase of AMMA completed, focus has shifted to maintenance of measurements (e.g. ground stations) established under AMMA, establishing leadership and coordination within Africa to continue AMMA-related research, and planning next steps.
- 26-28 May 2010, Bounding the Role of Black Carbon in Climate report Lead Authors meeting, Boulder, Colorado
  The third meeting of the Bounding BC lead authors was held, with focus on the synthesis sections of the document.
- 15 July 2010, Megacities Assessment Lead Authors meeting, Halifax, Canada
  Chapter leads of this IGAC/WMO Assessment report met to determine final steps needed to complete the report. Action items were decided on and circulated.
- 29 September 2010, meeting of the lead organizers of the ACPC initiative, Bern, Switzerland
  With the ACPC Science Plan now published, this workshop focused on planning the first ACPC field experiment, which will take place in Brazil.
- 4-6 October 2010, first organizational meeting of SAT-ACPC
  A new component of ACPC to address specifically how satellite-based measurements can be best used to improve our understanding of the role of aerosols in precipitation processes.
- 13-15 April 2011 ACC-MIP Workshop, Toulouse, France
  Discussed the first model results of ACC-MIP run and planned the next steps for the ACC-MIP analysis.

Communications/Networking

- Biennial Open Science Conferences
  - 2010 IGAC Open Science Conference "Challenging the Future"
    Held joint with CACGP
    11-16 July 2010
    Halifax, Canada
    This was the major event for IGAC in 2010, hosted by IGAC SSC member James Drummond of Dalhousie University. Major sub-themes of the conference were: 1. Climate chemistry interactions; 2. Observing atmospheric composition; 3. Chemistry at the interfaces; 4. Trace gas and aerosol source strengths; 5. Pollutant transformation and loss. The conference had ∼370 participants, with 65 oral presentations, and over 400 posters. As with past conferences, a major focus was the young scientists program, which included an icebreaker event, a chance to meet with senior scientists, a soccer game, a poster competition and funding support aimed specifically at young scientists. The IGAC Core Project office coordinated the funding to support the participation of 47 of the young scientists to attend the conference. Six of the young scientists won our conference-wide poster competition, and contributed articles about their posters to the May issue of the IGACtivities science newsletter.
  - The next biennial IGAC Open Science Conference will be held 17-21 September 2012 in Beijing, China. The conference will be entitled "Atmospheric Chemistry in the Anthropocene"
- IGACtivities Science Newsletter
  IGAC continues to produce a scientific newsletter on a 4 month basis that is distributed internationally to ∼3500 scientists.
- Web Pages
  - IGAC
    `http://igac.jisao.washington.edu/`

  - ACC-MIP
    http://www.giss.nasa.gov/projects/accmip/
  - Air Pollution & Climate Initiative
    http://www.igbp.net/page.php?pid=545

- Collaboration with Partner Organizations
  Ongoing collaboration with partner organizations in co-leading activities and workshops (see above) in order to enhance multi-national and multi-disciplinary collaborations.

3 Publications and Products

- IGAC Web Page
  http://igac.jisao.washington.edu
  Current IGAC activities, opportunities, and related meetings (as well as general information about the organization) are posted on the IGAC web page, which is hosted by the University of Washington and maintained by Collen Marquist, IGAC Administrative Specialist. In 2011, we improved web page by adding more specific information on IGAC activities and publications.
- IGACtivities Newsletter
  http://igac.jisao.washington.edu/newsletter/index.php
  While many peer-reviewed publications result from IGAC Tasks and activities, the primary product resulting directly from this grant is the IGAC newsletter, IGACtivities. The printing and mailing of the newsletter is taken care of by Academia Sinica in Taipei, but Megan L. Melamed (funded under this grant) is fully responsible for planning newsletter issues, recruiting article authors, and editing of the newsletter. A graphic designer at the University of Washington, Dept. of Atmospheric Sciences, is paid under this grant to do article layout. All past issues of the newsletter (now numbering 431 in total) are downloadable from the IGAC web page. .

4 Contributions

The role of the IGAC Project is two fold. Its first responsibility is to facilitate atmospheric chemistry research at an international level. Although IGAC does not conduct research, it does provide an "added value" to atmospheric chemistry research. Examples of this are IGAC's ability to get international collaboration for research field campaigns, which means that scientist funded at the national level gain access to resources, knowledge, and coordination thus getting more "bang for their buck" from their research grants, i.e. POLARCAT and AICI task. IGAC also has organized international efforts to address research needs in specific regions of the world, i.e. the IGAC AMMA-AC task, or on specific topics in atmospheric chemistry, i.e. the IGAC/iLEAPS/GEWEX ACPC initiative. In addition, IGAC coordinates the synthesis, assessment, and summary of research that would otherwise not occur, i.e. the Bounding the Role of Black Carbon as part of the IGAC/SPARC AC&C initiative. Most importantly, IGAC has a strong focus on engaging the next generation of young atmospheric scientist by providing travel grants to IGAC co-sponsored workshops, meetings, and conferences as well as highlighting the work of young scientist in its newsletter. Therefore, from early in their careers, these young scientist join an international network of atmospheric scientist that will further facilitate atmospheric chemistry at an international level.

IGAC's second responsibility is to ensure that the research done within the international atmospheric chemistry community is being disseminated into the wider Earth System Research community and more broadly to stakeholders (policy makers, economist, industry, general public, etc.). As part of the IGBP, IGAC provides the Earth System Research community with the most recent and pressing issues within atmospheric chemistry but also determines what research or information the atmospheric chemistry community can provide to answer Earth System Research questions, i.e. the IGBP Fast Track Initiative on Megacities and Coastal Zones. In addition, IGAC publishes books such as the IGAC/WMO Assessment of

Atmospheric Chemistry in Megacities that can reach a wider audience than individual papers published in atmospheric chemistry journals. IGAC also works to reach across the aisle into different disciplines in order to bridge the divide between scientific experts, i.e. the IGAC Atmospheric Chemistry & Health initiative. Finally, IGAC is also engaging stakeholders in order to address the most pressing issues of our time with activities such as the IGBP Air Pollution & Climate: A Science-Policy Dialogue initiative and the assessment on Bounding the Role of Black Carbon in Climate. Through its activities, IGAC provides an invaluable service to the international atmospheric chemistry community, the wider Earth System Research community, and to stakeholders both by advancing atmospheric chemistry research and disseminating the results of the research.