

Annual Report
NSF Grant AGS 1519623
NASA Grant NNX15AL96G
NOAA Grant NA12OAR4320137

Reporting Period: July 2016 - June 2017



**International Global Atmospheric Chemistry (IGAC) Project
International Program Office (IPO)**

PI: Dr. Megan L. Melamed
University of Colorado/CIRES
Box 216 UCB
Boulder, CO 80309

Accomplishments

1. Project Goals

The atmosphere is the integrator of the Earth system. Human emissions of pollutants and long-lived greenhouse gases into the atmosphere have caused dramatic transformations of the planet, altering air quality, climate and nutrient flows in every ecosystem. Understanding the global atmosphere requires an international network of scientists providing intellectual leadership in areas of atmospheric chemistry that need to be addressed, promoted and would benefit from research across disciplines and geographical boundaries. Acknowledgement of this need led to the formation of the International Global Atmospheric Chemistry (IGAC) Project in 1990.

IGAC's mission is to facilitate atmospheric chemistry research towards a sustainable world. This is achieved through IGAC's three focal activities: fostering community, building capacity, and providing leadership.

- **Fostering Community**

IGAC is an open international community of scientists researching topics related to atmospheric chemistry (air quality, climate change, carbon and nitrogen cycles, impacts on human health and ecosystems, etc.) that is actively collaborating across geographical boundaries and disciplines in order to contribute to addressing the most pressing global change and sustainability issues through scientific research. The IGAC biennial science conference and the facilitation of numerous thematic workshop every year provides opportunities to build cooperation and disseminate scientific information across IGAC international community.

- **Building Capacity**

IGAC builds scientific capacity through its early career program and national and regional working groups. The IGAC early career program allows scientists to join an international network early in their career, which puts the cogs in motion to further facilitate atmospheric chemistry research at an international level for years to come. The IGAC national and regional working groups create a strong cohesive community of atmospheric scientists in emerging countries/regions that together have a sum greater than their parts and connects these scientists to the larger IGAC community to foster international collaboration.

- **Providing Leadership**

IGAC provides intellectual leadership by identifying and fostering activities on current and future areas within atmospheric chemistry that would benefit from research across geographical boundaries and/or disciplines. IGAC's vision is to link emissions, atmospheric processes and atmospheric composition to global change and sustainability issues such as human health, climate, ecosystem and how individual and societal responses feedback onto the core research-led foci of IGAC (Fig.1).

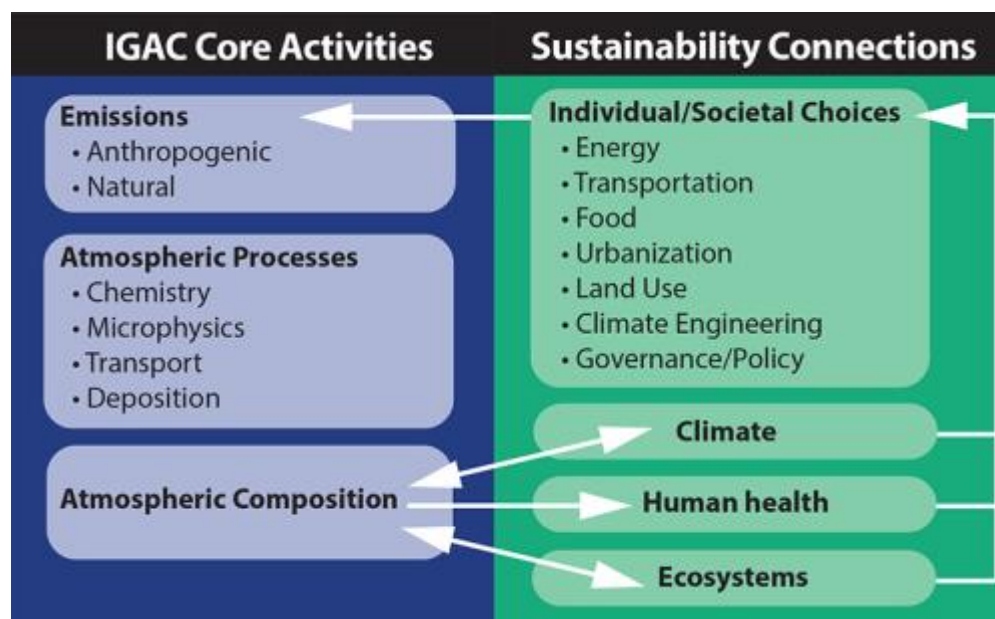


Figure 1. IGAC Vision Diagram

IGAC's priorities and activities are guided and, in many cases, implemented by an international volunteer Scientific Steering Committee (SSC). It is the IGAC IPO's responsibility to implement the priorities of the organization set forth by the SSC in collaboration with volunteer scientists from the international atmospheric chemistry community. This annual report describes the accomplishments of IGAC and the IGAC IPO from July 2016 - June 2017.

2. IGAC Activities

IGAC's mission and vision are in large part implemented by its sponsored and endorsed activities. These activities address an area of atmospheric chemistry research that requires coordination across geographical boundaries and/or disciplines, initiates new inquiry and/or fills a scientific need within the community, and addresses one or more of IGAC's focal areas.

A current list of IGAC Sponsored Activities follows:

Atmospheric Composition and the Asian Summer Monsoon (ACAM)

Jointly Sponsored by WCRP-SPARC

Co-Chairs: Laura Pan, National Center for Atmospheric Research, USA

Jim Crawford, NASA Langley Research Center, USA

ACAM is an emerging IGAC/SPARC activity that will be developed more fully over the next two years. Scientifically, the initiative focuses on four themes, each representing a key aspect of the connection between atmospheric composition and Asian monsoon dynamics: (1) Emissions and air quality; (2) Aerosols and clouds; (3) Convection and chemistry; (4) UTLS Response to the Asian Monsoon.

The Cryosphere and Atmospheric Chemistry (CATCH)

Co-Chairs: Jennie Thomas, LATMOS, France
Thorsten Bartels-Rausch, PSI, Switzerland
Markus Frey, British Antarctic Survey, UK

The CATCH mission is to facilitate atmospheric chemistry research within the international community, with a focus on natural processes specific to cold regions of the Earth. Cold regions include areas which are seasonally or permanently covered by snow and ice, from the high mountains to the polar ice sheets and sea ice zones as well as regions where ice clouds that undergo chemistry are found.

The IGAC SSC decided in 2016 to support CATCH as an emerging activity and foster its development for the next two years. In 2018 CATCH will be reviewed to see if it meets the requirements for becoming a fully sponsored IGAC Activity.

Chemistry-Climate Model Initiative (CCMI)

Jointly sponsored by WCRP-SPARC.
Co-Chairs: Bryan Duncan, NASA, USA
Michaela Hegglin, University of Redding, UK

CCMI is coordinating model evaluation and associated modeling activities between the domains of chemistry and climate dynamics. To best reflect current understanding, CCMI seeks to frame scientific inquiry in this arena through an integrated stratosphere-troposphere approach. These efforts are meant to culminate in increasingly accurate global atmospheric models to be used in the WMO/UNEP Scientific Assessment of Ozone Depletion and the IPCC Sixth Assessment Report (IPCC AR6).

Global Emissions Initiative (GEIA)

Jointly sponsored by iLEAPS, AIMES
Co-Chairs: Greg Frost, CU/CIRES and NOAA/ESRL/CSD, USA
Leonor Tarrason, NILU, Norway

Quantification of chemical emissions into the air is a key step in explaining observed variability and trends in atmospheric composition and in attributing these observed changes to their causes on local to global scales. Accurate emissions data are necessary to identify feasible controls that reduce adverse impacts associated with air quality and climate, to track the success of implemented policies, and to estimate future impacts. GEIA is a community effort that builds bridges between environmental science and policy, by bringing together people, data, and tools to create and communicate the highest quality information about emissions. GEIA seeks to enhance access to emissions data, facilitate analysis to improve the scientific basis for emissions information, and strengthen the emissions community.

Interdisciplinary Biomass Burning Initiative (IBBI)

Jointly sponsored by iLEAPS and WMO

Co-Chairs: Johannes Kaiser, ECMWF, Reading, UK

Melita Keywood, CSIRO, Melbourne, Australia

Biomass burning changes the land surface drastically and leads to the release of large amounts of trace gases and aerosol particles that play important roles in atmospheric chemistry and climate. In addition, there is large uncertainty on how climate change and global change will impact the frequency, intensity, duration, and location of biomass burning in the short- and long-term making their emissions a large source of uncertainty of future atmospheric composition. Therefore biomass burning and its emissions need to be observed and modeled accurately for understanding the composition of the atmosphere and how it changes at different temporal and spatial scales. Significant gaps remain in our understanding of the contribution of deforestation and savanna, forest, agricultural waste, and peat fires to emissions. IBBI will help better quantify the present and future impact of biomass burning emissions on the composition and chemistry of the Earth's atmosphere.

air Pollution in the Arctic: Climate, Environment, and Societies (PACES)

Co-Chairs: Steve Arnold, University of Leeds, UK

Chuck Brock, NOAA/ESRL/CSD, USA

Kathy Law, LATMOS, France

In the next 10 years, PACES aims to tackle key gaps in our understanding of the processes controlling air pollution in the Arctic by creating new collaborative efforts between observational and modeling groups, social science researchers, and local Arctic communities. PACES seeks to advance Arctic air pollution research in a transdisciplinary approach, develop further capacity in terms of regular long-term monitoring and intensive field observations from the surface to throughout the troposphere, and improve predictive capabilities across a range of scales to diagnose winder impacts of Arctic air pollution on regional and global climate, Earth system, and on local air quality and ecosystems.

Tropospheric Ozone Assessment Report (TOAR): Global metrics for climate change, human health and crop/ecosystem research

Chair: Owen Cooper, NOAA/ERSL, CU/CIRES, Boulder, CO USA

Tropospheric ozone is a greenhouse gas and pollutant detrimental to human and vegetation health. Since 1990 the anthropogenic emissions that react in the atmosphere to produce ozone have shifted from North America and Europe to Asia. This rapid shift, coupled with limited ozone monitoring in developing nations, has left scientists unable to answer the most basic questions: Which regions of the world have the greatest human and plant exposure to ozone pollution? Is ozone continuing to decline in nations with strong emission controls? To what extent is ozone increasing in the developing world? TOAR will address these questions by developing global metrics of ozone for climate change, human health and crop/ecosystem research.

In 2016, the IGAC SSC decided to end the Fundamentals of Atmospheric Chemistry activity and instead make fundamental scientific research a priority/focus area of IGAC. IGAC had adopted the following statement regarding fundamental scientific research:

*IGAC aims to continue expanding the capacity of the international atmospheric chemistry community to understand atmospheric composition by fostering **fundamental scientific research** on emissions and atmospheric processes.*

This change was in part motivated by the 2016 National Academies of Sciences, Engineering and Medicine report entitled *The Future of Atmospheric Chemistry Research: Remembering Yesterday, Understanding Today, Anticipating Tomorrow*. The report provides a framework for guiding fundamental scientific research on atmospheric chemistry that IGAC has adopted in the statement above.

During the 2016 IGAC SSC meeting, IGAC supported the development of two other activities that are in the early phase of development. One is on fostering an international assessment of inverse modeling of emission and the other is an international network for monitoring, analyzing, and forecasting regional air quality (MAP-AQ). These two proposed activities will be defined in the next one to two years.

A current list of IGAC Endorsed Activities follows:

IGAC endorses developing, new or existing activities that help IGAC achieve its mission and implement its vision. IGAC endorsement often helps activities gain international recognition and/or funding. Endorsed activities receive no funding from IGAC and have less oversight from the IGAC SSC. In some cases, IGAC endorsed activities are former IGAC Sponsored Activities that have matured to the point that the funding and fostering by IGAC is no longer needed, but the connection to IGAC is desirable for both the activity and IGAC to fulfill their goals.

Aerosols, Clouds, Precipitation, and Climate (ACPC)

Jointly endorsed by GEWEX and iLEAPS

Co-Chairs: Daniel Rosenfeld, The Hebrew University of Jerusalem, Israel

Johannes Quaas, University of Leipzig, Germany

The ACPC initiative aims at a better scientific understanding of these interactions at a fundamental level. The goal is to identify, disentangle and quantify signals of impacts of aerosol perturbations on clouds, precipitation and radiation, taking into account adjustments and feedback processes, by synergistically exploiting observations and models across scales.

The IGAC SSC decided in 2016 to endorse the Aerosol, Clouds, Precipitation, and Climate (ACPC) initiative. ACPC is a former IGAC Activity that has matured to the point that its relationship with IGAC is best served through IGAC's endorsement.

Deposition of Biogeochemically Important Trace Species (DEBITS)

Jointly endorsed by WMO

Chair: Corinne Glay-Lacaux, Paul Sabatier University, France

Wet and dry deposition of chemical species to the Earth's surface plays an essential role in controlling the concentration of gases and aerosols in the troposphere. The chemical composition of atmospheric deposition provides important information on many interacting physical and chemical mechanisms in the atmosphere such as emission sources, atmospheric dynamics and transport, atmospheric removal processes, and nutrient cycling in ecosystems. Long-term research on deposition thus provides critical information on natural and anthropogenic influences on the atmosphere and provides information on the temporal and spatial evolution of atmospheric chemistry.

Surface PARTICULATE mAtter Network (SPARTAN)

Chair: Randall Martin, Dalhousie University

SPARTAN is a targeted network of ground-based measurements of fine particle concentrations and limited compositional features. Their primary focus is on PM_{2.5} mass, since it is a robust indicator of mortality and other adverse health impacts in epidemiologic cohort studies of long-term exposure. The SPARTAN network includes a combination of automated continuous monitoring and integrated filter samples. Priority SPARTAN locations have high population density, sparse PM_{2.5} monitoring, and existing sunphotometer measurements of aerosol optical depth (AOD). Together, these instruments provide an empirical measure of the AOD/PM_{2.5} ratio that is used to relate satellite AOD retrievals to ground-level PM_{2.5}.

3. IGAC National/Regional Working Groups

There are many regions of the world where there are many great scientists but often their research is conducted very independently and their results often don't reach the international community. However, as atmospheric chemistry research questions and their connections to societal issues become more regional, there is a strong desire to engage these scientists in order to incorporate their research and local knowledge of these regions of the world. Therefore, 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 greater than its parts, and the second is to connect the regional/national working groups to the larger IGAC community in order to foster international collaboration. IGAC currently is sponsoring the following working groups:

IGAC China Working Group

Chair: Tong Zhu, Peking University China

The sheer magnitude of China's landmass coupled with its growing and economically advancing population makes it critical to understand its role in air quality and climate on

both regional and global scales. Chinese atmospheric chemists have been conducting frontier research for forty years in areas such as urban and regional air pollution and the climate effects and health impacts of air pollution. IGAC, through multilateral sponsorship, intends to more fully integrate Chinese research experience through its first national working group in China. The goals of the IGAC China Working Group are to:

- Encourage participation of Chinese atmospheric scientists to engage their leadership in international, multilateral 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.

IGAC Americas Working Group

Co-Chairs: Nestor Rojas, Universidad Nacional de Colombia, Colombia
Laura Dawidowski, CNEA, Argentina

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. There is a priority on bringing together scientists from across the entirety of the Americas. To this end, the Americas Working Group seeks to:

- Improve the collaboration and communication between scientists in Latin America;
- Connect the Latin America community to the international community;
- Train and foster the next generation of scientists;
- Influence and promote a more proportionate distribution of funds for research
- Enhance visibility and credibility of scientists in Latin America

Japan National Committee

Chair: Hiroshi Tanimoto, National Institute for Environmental Studies, Japan

Under the Science Council of Japan, the IGAC-Japan National Committee has goals to:

- Encourage participation of Japanese 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 by Japan;

- Provide advice or consultation on major research plans in atmospheric chemistry by Japan to promote funding support;
- Promote academic exchange on atmospheric research by Japan and internationally, especially with other IGBP-Japan or WCRP-Japan Committees; and
- Provide a platform in Japan to facilitate the academic growth and development of young researchers in atmospheric chemistry.

IGAC Monsoon Asia and Oceania Networking Group (MANGO)

Co-Chairs: Hiroshi Tanimoto, National Institute for Environmental Studies, Japan
 Kim Oahn, Asian Institute of Technology, Thailand
 Manish Naja, AIREAS, India

In response to an increasing demand for environmental issues, atmospheric chemistry programs in Asia are rapidly growing. However, there is a large asymmetry between countries - some with their own national communities and some with only a handful, if any, atmospheric chemists. Hence we recognize the need to coordinate an atmospheric chemistry community at a regional level in Asia. The IGAC Monsoon Asia and Oceania networking group aims to establish robust cooperation between IGAC activities in Asia.

4. Opportunities for Training and Profession Development

Arguably IGAC's primary role is fostering community and building capacity, which is exemplified every two years at its biennial Science Conference, which is the primary mechanism for IGAC to foster collaborations and disseminate scientific information across its international community. A key component of the biennial IGAC Science Conferences is the Early Career Scientists Program. The early career scientists are deeply engaged in an international network of atmospheric scientists early in their career that will further facilitate atmospheric chemistry research and cooperation at an international level.

During the July 2016-June 2017 IGAC IPO Grant, IGAC hosted the following biennial science conference.

14th IGAC Science Conference: *One Atmosphere – Building a Collective Knowledge* 26-30 September 2016 Breckenridge, CO, USA

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

- Session 1: Atmosphere chemistry and urbanization
- Session 2: Atmospheric chemistry, ecosystems and agriculture
- Session 3: Atmosphere chemistry and energy
- Session 4: Atmospheric chemistry and fundamental studies
- Session 5: Atmospheric chemistry and climate change
- Session 6: Atmospheric chemistry: Observing composition and variability

There were 12 invited speakers, 50 oral presentations, three keynote addresses, and one guest speaker in addition to 367 posters. A total of 494 participants attended the IGAC 2016 Conference, representing 36 countries. About 200 participants, or 40%, were early career or student scientists.

With the help of generous sponsors (NSF, NASA, NOAA, DOE, WMO, and ESA), IGAC supported 70 Early Career scientists from around the world to attend the 2016 conference. Special events and activities were coordinated for these participants throughout the week to help create an international network of early career scientists. In addition, six Early Career Poster Presentation and one Early Career Oral Presentation Awards were handed out. These seven outstanding early career scientists were profiled in IGACnews following the conference.

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

**First IGAC Early Career Short Course
23-25 September 2016
Boulder and Breckenridge, CO, USA**

A selected group of 36 participants from 19 countries engaged in an intensive three-day early career short course (ECSC). The core themes of the 2016 IGAC ECSC were modern science, science communication and science policy engagement, making your science impactful, and developing mentoring skills. The modern science session took place in Boulder, CO and included yours of the NOAA Chemical Science Division, the NCAR Research Aviation Facility, and the NCAR Vis Lab. The following three sessions on science-policy engagement, impactful science and mentoring skills took place in Breckenridge, CO. Participants of the ECSC were then asked to be leaders for the Early Career Program that took place during the IGAC Science Conference to help further the collaboration and networking of ALL early career scientists. Based on the comments received from the early career scientists, IGAC will continue to develop its early career short course as it was deemed very successful. The IGAC Early Career Short Course was supported via a grant by IGAC's former sponsor IGBP.

In addition to its biennial Science Conference and Early Career Short Course, IGAC also builds scientific capacity around the globe by financially sponsoring or endorsing workshops. Financial sponsorship of workshops is typically on the level of \$3-7K in the form of travel grants. Members of the IGAC community can also seek IGAC endorsement of a workshop that supports IGAC's mission and goals. The small amount of IGAC seed funding and/or endorsement of a workshop often acts as a catalyst for generating more funding from the nation or region where the workshop is taking place. Table 1 lists the workshops that IGAC financially sponsored during the July 2016 – June 2017 and Table 2 lists the workshops that IGAC endorsed during this time period.

Table 1. Workshops Sponsored by IGAC from July 2016 – June 2017

Workshop Title	Location	Date
Workshop on Forecasting Emissions from Vegetation Fires and their Impacts on Human Health and Security in Southeast Asia	Jakarta, Indonesia	29 August – 1 September 2016
IGAC Americas Working Group Meeting	Santiago, Chile	30-31 March 2017
First CATCH Workshop	Guyancourt, France	19-20 April 2017
3 rd ACAM Workshop	Guangzhou, China	5-9 June 2017
2 nd ACAM Training School	Guangzhou, China	10-12 June 2017
IGAC Africa Science Activity: Scoping Workshop	Pretoria, South Africa	7-9 June 2017
CCMI Science Workshop 2017	Toulouse, France	13-15 June 2017
3 rd PACES Workshop	Victoria, BC, Canada	27-29 June 2017

Table 2. Workshops Endorsed by IGAC from July 2016 – June 2017

Workshop Title	Location	Date
24 th International Symposium on Gas Kinetics and Related Phenomena	York, UK	17-21 July 2016
AAAR Special Symposium: Effects of NOX and SO2 on BVOC Oxidation and Organic Aerosol Formation	Portland, OR, USA	20 October 2016
2 nd International Workshop on Heterogeneous Atmospheric Chemistry	Tsukuba, Japan	12-13 November 2016
Towards a First Emission Inventory in South America Workshop	Santiago, Chile	27-29 March 2017
ACPC Workshop	Bad Honnef, Germany	2-6 April 2017

5. IGAC Communications/Networking

The IGAC IPO spends a significant amount of time on its communication strategy in order to better communicate IGAC activities to scientists, students, policy makers, stakeholders and the general public. IGAC's communication strategy currently includes:

- **IGAC Website (igacproject.org)**
IGAC launched a redesigned website in April 2017 for a more modern design that is tablet and smartphone friendly. The website is kept up to date with recent publications, mailing announcements and upcoming events.
- **IGAC Mailing List**
IGAC publishes monthly eBulletins to ~4,000 subscribers via MailChimp. The eBulletins informs the international atmospheric chemistry community about upcoming deadlines, events, job announcements, and community news related to IGAC and the wider global change and sustainability community. IGAC keeps the community informed with a few select announcements IGAC sponsored and endorsed workshops, IGAC SSC nominations, etc.

- **IGACnews**
IGAC continues to produce a thrice yearly IGACnews that is distributed internationally to ~4,000 members of the IGAC community. IGACnews engages and informs the international community by providing information on IGAC activities through Editorials, Workshop Summaries, Activity Updates and Scientific Features. Each edition of IGACnews has an Early Career Scientist Spotlight that profiles an individual in graduate school or within 3 years of completing his/her doctorate. The Open Submission section allows non-IGAC activities related to atmospheric chemistry to publish Workshop Summaries, Activity Updates and Scientific Features. Archives of all IGACnews can be found on the IGAC Website.
- **Social Media**
IGAC is also found on social media outlets such as Facebook, Twitter, LinkedIn, YouTube and Instagram. IGAC continues to explore how to leverage social media to further advance international scientific collaborations in atmospheric chemistry research.
- **Visualizations**
IGAC continuously works with a graphic designer to create logos for its activities as well as communicate science more effectively through diagrams, figures and graphs.
- **Presentations**
The IGAC EO and members of the IGAC SSC give presentations on a regular basis on IGAC. Audiences for these presentations vary from town hall meetings, e.g. AGU, to international organizations, e.g. WMO.

6. Strategic Outlook

The IGAC IPO will continue to be funded via this grant through June 2018. During the last year of funding on this grant, IGAC will enhance collaborations with other international organizations such as WMO, UNEP, and World Health Organization (WHO) in order to enhance IGAC's science-policy engagement and promote the importance of atmospheric chemistry research for addressing air quality. In addition, IGAC will continue to work with its new sponsor Future Earth and be part of a global platform for international scientific collaboration that will promote the development of knowledge required to address global environmental change and sustainability issues. The most important focus of IGAC will continue to be facilitating atmospheric chemistry research toward a sustainable world by fostering community, building capacity, and providing leadership. IGAC plans to submit a renewal proposal to NSF, NASA, and NOAA this year for continued funding of the IGAC IPO from July 2018-June 2021.

Products

- **Publications**
Melamed, M.L., J. Schmale, and E. von Schneidmesser. (2016). Sustainable Policy – Key Consideration for Air Quality and Climate Change. *Current Opinion in Environmental Sustainability*. Doi: 10.1016/j.cosust.2016.12.003.
- **Websites**
igacproject.org

- **Other Products**

IGACnews, <http://igacproject.org/IGACnews>

Participants

The International Global Atmospheric Chemistry (IGAC) Project's International Project Office (IPO) is located at the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado, Boulder. One employee has been supported within the IGAC International Project Office from July 2016 through June 2017. Dr. Megan L. Melamed works 100% time as the IGAC Executive Officer.

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 as of January 2017 are listed in Table. 3.

Table 3. 2017 IGAC SSC

Last Name	First Name	Institution	Country
Lawrence	Mark (Co-chair)	IASS	Germany
Tanimoto	Hiroshi (Co-chair)	NIES	Japan
Beukes	Paul	North-West University	South Africa
Crawford	James	NASA	USA
Frost	Gregory	NOAA	USA
George	Christian	CNRS	France
Grutter	Michel	UNAM	Mexico
Heald	Colette	MIT	USA
Hoelzemann	Judith	URFN	Brazil
Lewis	Alistar	University of York	UK
Murphy	Clare	University of Wollongong	Australia
Murphy	Jennifer	University of Toronto	Canada
Naja	Manish	AIRES	India
Oahn	Kim	Asian Institute of Technology	Thailand
Pandis	Spyros	University of Patras	Greece
Wang	Tao	Hong Kong Polytechnic University	China
Yassa	Nouredine	CDER	Algeria

In addition to SSC members, IGAC relies on the involvement of the entire international atmospheric chemistry community in order to carry out its activities. This is both evident in the leaders of IGAC Activities and National/Regional Working Groups mentioned in this report as well as the scientists participating in the activities and working group and the attendees IGAC sponsored and endorsed workshops and conferences.

Impacts

The role of the IGAC Project is to continue to foster and respond to the international atmospheric chemistry research community and to represent the atmospheric chemistry community at an international level to the broader global change and sustainability community. Over the last 25 years, IGAC has fostered an international community of over several thousand scientists working on topics related to atmospheric chemistry. IGAC continues to build its community by engaging with scientists from around the world, sponsoring or endorsing numerous workshops, and hosting an international science conference on a biennial basis. Through its early career scientists program and its national/regional working groups, IGAC is both engaging the next generation of scientists and elevating scientists and their research in underrepresented regions of the world. IGAC is also providing scientific leadership by working with its community to identifying and sponsor/endorse activities that reach across geographical and disciplinary boundaries to contribute to addressing the most pressing global change and sustainability issues through scientific research.

IGAC's second role is to represent the atmospheric chemistry research community in the broader global change and sustainability community. As Global Research Project of Future Earth, IGAC will contribute to understanding the current state of knowledge of and identifying the most pressing issues in global change and sustainability research. IGAC facilitates integrative research and synthesis efforts that leverage atmospheric chemistry research to address larger global change and sustainability issue, e.g. air Pollution in the Arctic: Climate, Environment, and Societies (PACES). In addition, IGAC is working with international organizations, such as UNEP's Coalition for Clean Air and Climate (CCAC), to involve scientists from its national/regional working groups to be lead and contributing authors on high-level reports. Through its activities, IGAC provides an invaluable service to the international atmospheric chemistry community, the wider global change and sustainability community, and to stakeholders both by advancing atmospheric chemistry research and contributing to understanding global change.