IGACtivities NewsLetter
of the International Global Atmospheric Chemistry Project

Issue No. 9, July 1997

In this Issue

A Note From the IGAC Chair
Guy Brasseur

Three Important IGAC Meetings in Toronto

During the month of May, three important IGAC meetings took place in Toronto, Canada.

First, at the invitation of the University of Toronto, a conference on "Global Measurement Systems for Atmospheric Composition" took place under the auspices of three international organizations: IGAC, the WCRP's Stratospheric Processes and their Role in Climate (SPARC) project and the WMO's Global Atmosphere Watch (GAW). This conference provided the more than 100 attending scientists from a large number of countries a unique opportunity to review space missions which have provided and will continue to provide extremely valuable information on the chemical composition of the atmosphere, and on the global budgets of chemical compounds. Measuring many important chemical constituents in the troposphere remains a challenge, but thanks to ingenious improvements in technology, these measurements will become feasible in the coming years. Several missions planned by NASA in the US, ESA in Europe, and NASDA in Japan were discussed during the Conference. Exciting science will result from these future space observations.

Space programs will be successful only if they are closely related to ground observation activities, field campaigns, and data assimilation and interpretation projects. Systematic ground observations are performed, for example, by WMO/GAW, as well as other measurement networks. The GAW measurement program focuses on ozone, greenhouse gases, solar radiation, UV-B, atmospheric turbidity, reactive species such as SO_2, NO_X, and CO, precipitation chemistry, and atmospheric aerosols. The time evolution of several greenhouse gases including CO_2 and methane (as well as isotopic ratios), and CFCs is also measured in a systematic way by networks such as those maintained by NOAA/CMDL and ALE/GAGE. Field campaigns focusing on processes will also remain very important in the future, because they provide the only approach to understanding key chemical and photochemical processes occurring in the atmosphere, which are responsible for the formation and destruction of chemical compounds.

Much progress has also been made recently in the development of

chemical transport models of the atmosphere, which will be used to assimilate and analyze global data bases. Such models provide a synthetic picture of our current understanding of atmospheric processes. Inverse calculations are being performed by several research groups to infer sources and sinks of chemical compounds (such as CO_2 or methane) which provide the best agreement between calculated atmospheric concentrations and the observations at the different stations of measurement networks. In this issue of IGAC*tivities* you will read about the initial efforts of IGAC's *Global Integration and Modeling* (GIM) Activity whose mission is to facilitate the development and improvement of global chemical transport modeling capabilities.

I'd like to thank Professor Jim Drummond and his University of Toronto team for having organized this conference so masterfully.

The gathering in Toronto also provided the opportunity for initiating a new IGAC project focusing on global tropospheric ozone. This project is being formulated so that all forthcoming data obtained from space observations, field campaigns and operational stations can be used intelligently to address important scientific and societally relevant questions.

Tropospheric ozone is of concern for several reasons: First, together with other chemical compounds, it determines the "oxidizing capacity" of the atmosphere, and hence the ability of the atmosphere to destroy chemical compounds, including pollutants, which are injected into the atmosphere. Second, ozone is a greenhouse gas, and changes in its tropospheric abundance as a consequence of human activities could produce climate changes. And third, at the Earth's surface, ozone is a component of photochemical smog, which affects human health and terrestrial ecosystems adversely.

The purpose of the *Global Tropospheric Ozone Project* (GTOP) is to provide an international framework under which a large suite of national and international research initiatives related to tropospheric ozone and its precursors can be coordinated. As indicated by the conveners of this new project (Jack Fishman (USA), Matthias Beekmann (France), Shyam Lal (India) and Dominique Nganga (Congo)), GTOP will be developed with a five-theme approach: Awareness, Education, International Cooperation, Observations, and Understanding. In the next months, a small team of interested scientists will complete a science plan and begin constructing an implementation plan for the project.

The IGAC Scientific Steering Committee (SSC) also met in Toronto. A major issue for the SSC was to initiate a "refocusing" of IGAC Activities. The decision has been made to center our future activities around 3 major science themes: (1) biosphere/atmosphere interactions; (2) atmospheric oxidants and photochemistry; and (3) atmospheric aerosols. In addition, IGAC will continue to support fundamental activities such as intercalibrations, as well as education and capacity building. We will report further on this new structure in the future issues of IGAC*tivities*.

Another important accomplishment at Toronto was, for the first time, a joint meeting between the SSC and representatives of funding agencies from several countries. The purpose was to initiate a dialogue with national and regional agencies that support atmospheric-biospheric chemistry research in hopes of facilitating optimization of the international planning process in this area.

Through this dialogue we hope to achieve a clear, mutual understanding of issues related to the conception, planning, and implementation of future IGAC research, with an emphasis on major field campaigns, longer-term measurement activities, and their overall coordination, and to identify specific actions that the IGAC SSC might take to facilitate better coherence between IGAC plans and national initiatives in atmospheric-biospheric chemistry research.

Finally, I am pleased to report that the SSC appointed three new Vice-Chairs: Jariya Boonjawat of Thailand, Patricia Matrai of the USA, and Stuart Penkett of the UK. I am convinced that these three world-class scientists will contribute greatly to the continuing success of IGAC and the IGBP.

Features

IGAC's Global Integration and Modeling (GIM) Activity

Contributed by M. Kanakidou, CFR/CNRS, France, and P. Kasibhatla, Duke University, USA

Introduction

It is now a fact that the atmospheric concentrations of several chemically and radiatively important trace constituents (gases and particles) are changing, primarily due to human influences. Several trace constituents like primary aerosols, methane (CH_4), nitrous oxide (N_2O), nitrogen oxides ($NO + NO_2$), carbon monoxide (CO), nonmethane hydrocarbons (NMHC), sulfur dioxide (SO_2), dimethylsulfide (DMS) and halocarbons have direct anthropogenic and/or natural emissions to the atmosphere. Others, like ozone (O_3) and secondary aerosols, are produced from chemical reactions of their precursors. In turn, the changing atmospheric concentrations of these trace constituents can affect the radiative balance and climate of the earth. To understand and reliably predict chemical and climate changes in the atmosphere, a thorough understanding of the chemical, physical, biological and climatic processes which affect the distributions of trace constituents in the atmosphere, and of the interactions between these processes is required.

In this context, numerical models are especially useful tools for evaluating the global budgets of trace constituents, for understanding the evolution of trace constituent distributions due to natural and anthropogenic forcings, and for assessing atmospheric chemistry-climate interactions. The *Global Integration and Modeling* (GIM) Activity is a recently-initiated effort under the IGAC Global Focus which specifically aims to address the development and application of advanced three-dimensional global chemical transport and coupled climate/chemistry models, with an emphasis on tropospheric applications. It is important to note that several mature research efforts focused on global-scale tropospheric chemistry and transport modeling already exist. Thus, the activities to be undertaken as part of GIM will be directed towards facilitating these existing efforts, rather than developing independent modeling capabilities. With this in mind, GIM will pursue its goals by: (i) conducting a series of model intercomparison exercises focusing on key problems in tropospheric chemistry; (ii) conducting workshops specifically targeted to graduate students and postdoctoral researchers and focusing on the latest developments in tropospheric chemistry and climate modeling; (iii) collaborating actively with other on-going model development and evaluation efforts such as those being carried out as part of the World Climate Research Program and the NASA/Global Modeling Initiative; and (iv) establishing close linkages with other on-going IGAC Activities such as the *Global Atmospheric Chemistry Survey* (GLOCHEM), the *Global Emissions Inventory Activity* (GEIA), and others.

In the sections below we provide a brief description of tropospheric chemistry and transport models, elaborate on specific GIM efforts that have been initiated or are planned for the near future, and outline the organizational structure of GIM.

Tropospheric Chemistry and Transport Models (CTMs)

Tropospheric CTMs are numerical models which simulate the interactions between processes such as emissions, photochemical production and destruction, convective and synoptic mixing, and dry and wet deposition, which together shape the distribution of trace constituents. These models are time-dependent and, depending on their spatial resolution, can be classified as 1-, 2-, and 3-dimensional models. Depending on the horizontal extent of the area considered, one distinguishes between limited area or mesoscale models and global models. The limited area/mesoscale models cover areas up to a few thousand square kilometers, and can be subdivided into 3 main categories:

1) The *g* mesoscale models covering areas of 1-10 km^2 (for instance urban core and urban perimeter, and local models) used for studying changes occurring within a few minutes;

2) The *b* mesoscale models extending from about 10 to 100 km^2 (regional models) used for studying transport and chemical processes occurring on the time-scale of several hours. On this spatial and temporal scale, photochemistry can produce pollution episodes and have a significant impact on relative long lived trace gas concentrations; and

3) The *a* mesoscale models covering areas of hundreds to thousands of of km^2 (for instance the North American continent) which corresponds to the scale of occurrence of synoptic transport (high and low pressure meteorological systems).

The rapidly increasing computational capabilities of modern-day computers enhance the use of atmospheric chemistry transport models at various spatial resolutions. The same global or mesoscale model can be run with different horizontal and vertical resolutions or can have the option of using a window with higher resolution over a particular area of interest.

Another classification of tropospheric CTMs is based on the meteorology used to drive the model. In decoupled or "off-line" CTMs, chemistry is not allowed to feed back into meteorology. The meteorology used to drive these models is derived either from general circulation models (GCMs) which simulate the ensemble of meteorological events corresponding to a generic time-period or from assimilation-based models which simulate specific time periods. In either case, the meteorology used to drive most off-line CTMs is synoptic in nature, though a few CTMs are climatological in nature with the transport based on monthly-mean winds. The most advanced models used for tropospheric chemistry studies are the fully coupled general circulation/chemistry or "on-line" models in which chemistry, meteorology, and radiative transfer are computed simultaneously and changes in the chemical species concentrations may affect meteorology and climate and vice-versa.

Both off-line and on-line models are useful. On-line models are advantageous for studying chemistry-climate interactions, while off-line models offer a computationally efficient tool for studying the global distributions and budgets of a number of important tropospheric species which are influenced by climate only indirectly.

Tropospheric CTMs are useful in unraveling the complex physical and chemical interactions that shape tropospheric trace constituent distributions. A key component of any model development and evaluation exercise is evaluation against relevant field measurements. Such measurements include both *in situ* and remote data and, depending on the nature of the CTM, may be climatological or episodic in nature. The CTMs in turn can be used for designing field measurement campaigns, and for interpreting and analyzing the data gathered from these campaigns.

Specific GIM Efforts

The development and application of comprehensive CTMs for tropospheric O_3 and aerosols is of considerable scientific importance. Tropospheric O_3 plays a central role in determining the oxidizing power of the atmosphere and is also an important greenhouse gas. Tropospheric aerosols are believed to significantly affect the Earth's radiative balance, and can affect gas phase chemical composition via heterogeneous reactions. Furthermore, in some polluted regions both O_3 and fine particles are believed to pose risks to human health as well as agricultural crops and forest resources.

Over the last decade or so, there has been considerable research in the development and application of CTMs for tropospheric O_3. Similarly, a number of models have been developed for evaluating the mass distribution of sulfate aerosols. Less advanced is our capability to simulate particle size distributions in CTMs, though again there is considerable ongoing research in this area. Keeping in mind GIM's objectives of facilitating rather than developing tropospheric CTMs, three distinct activities have been developed in the general areas of tropospheric O_3 and aerosol modeling. These are: (i) a tropospheric O_3 global CTM intercomparison exercise; (ii) an aerosol dynamics model intercomparison exercise; and (iii) a tropospheric global aerosol modeling workshop and intercomparison exercise. Of these, the tropospheric O_3 intercomparison is well underway, and is discussed in detail below. The aerosol modeling activities are in the planning stages, and are also briefly discussed below.

Tropospheric O_3 Global CTM Intercomparison Exercise

The objective here is to evaluate systematically the capabilities of the current generation of global tropospheric O_3 CTMs, and to identify key areas of uncertainty in our understanding of the tropospheric O_3 budget. To accomplish this goal, a tropospheric O_3 modeling intercomparison exercise was organized during the late summer/early fall of 1996 involving research groups from a number of institutions. The strategy was to investigate the convergence of the models and the extent to which the models reproduce observed characteristics of tropospheric O_3. A total of 12 global 3-dimensional CTMs, together with the contributing scientists, are listed in Table 1.

A meeting to discuss the preliminary results from this exercise was held at Gif-sur-Yvette in France in November, 1996. Figure 1 shows examples of model comparisons for surface O_3 and CO, respectively, at the Barrow, Alaska, and Cape Grim, Tasmania baseline stations. Observed mixing ratios and standard deviations are plotted for comparison purposes. It is encouraging that the model simulations reproduce the general variations of the measured monthly-mean concentrations. However, major differences in the model outputs are obvious and remain to be analyzed in terms of the O_3 budget in the free troposphere and in particular close to the tropopause. These differences are also reflected in the OH distribution calculated by the various models. This is illustrated in Table 2 which shows the methane lifetimes calculated by the models.

A more detailed diagnostic analysis of the O_3

Table 1. Three-dimensional CTMs that participated in the tropospheric O_3 global modeling GIM intercomparison exercise

Model Name	Contact
IMAGES	J.-F. Muller, G.P. Brasseur, C. Granier
GFDL	H. Levy II
HARVARD	D. Jacob
ECHAM	G.-J. Roelofs
TM3	F. Dentener, S. Houweling
IMAU3	M. Krol
CTMK	W.M.F. Wauben
MATCH	M.G. Lawrence, P.J. Crutzen
MOGUNTIA	N. Poisson, M. Kanakidou
MOZART	D.A. Hauglustaine, G.P. Brasseur
UKMETO	R.G. Derwent, C.E. Johnson, W.J. Collins, D.S. Stevenson
UIO	T.K. Berntsen, I. Isaksen

intercomparison results is now underway. A follow-up meeting of the GIM O_3 Action Committee is planned for the fall of 1997 to summarize the results of this exercise and finalize the preparation of a manuscript detailing these results of the analysis. Further details can be obtained from Dr. Maria Kanakidou (e-mail: mariak@lmce.saclay.cea.fr).

Aerosol Dynamics Model Intercomparison Exercise

At the November 1996 workshop in France, there was a general consensus that the organization of an aerosol modeling intercomparison exercise would be of considerable value to the atmospheric sciences community. A proposal defining a limited intercomparison (focusing on the treatment of H_2SO_4-H_2O aerosol formation and growth in box models) was prepared and circulated by P. Kasibhatla. In June 1997 a zero-dimensional intercomparison exercise to test the numerical fidelity of various techniques used to parameterize the aerosol size distribution in large-scale CTMs has been defined as a collaborative effort between the European Aerosol Assembly and GIM. Further details of this exercise can be obtained from the World Wide Web at http://www.tropos.de in the Cooperation Section.

Tropospheric Global Aerosol Modeling Workshop and Intercomparison Exercise

The goal of this exercise is to perform a detailed evaluation of the capabilities of the current generation of global aerosol models that are used to characterize the distribution of sulfates, soil dust, and black carbon. This exercise will be conducted jointly with the WCRP's Working Group on Numerical Experimentation, and is a follow-up to the WCRP-sponsored 1995 workshop on Transport and Scavenging of Trace Constituents by Clouds in Global Atmospheric Models. As part of this exercise, it is currently planned to hold a workshop in September 1998 in Nova Scotia. Part of the workshop will be devoted to invited talks on the parameterization of various relevant physical and chemical processes in global aerosol models, and part of the workshop will be focused on model evaluation and intercomparison activities. Further information on this can be found in the "Announcements" section of this newsletter or can be obtained from Dr. Len Barrie (e-mail: len.barrie@ec.gc.ca).

In addition to the above-mentioned activities, Drs. Martin Heimann (e-mail: martin.heimann@dkrz.de) and Dana Hartley (e-mail: hartley@voir.eas.gatech.edu) have taken the lead in organizing a Workshop on

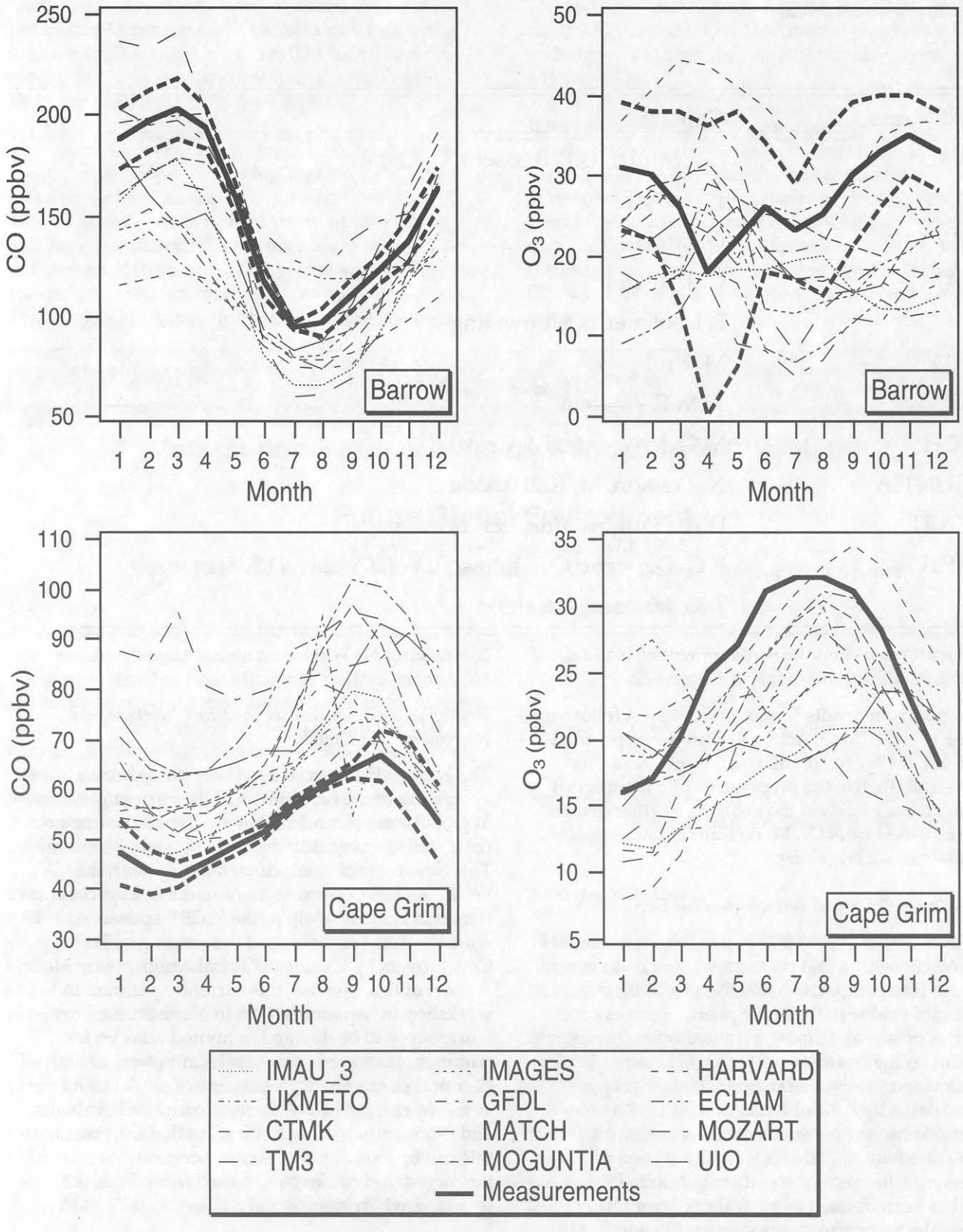


Figure 1. Results of model simulations of the annual cycles of ozone and carbon monoxide at the baseline observatories at Barrow, Alaska (USA) and Cape Grim, Australia. Observed mixing ratios (heavy solid lines) and their standard deviations (heavy dashed lines) are plotted for comparison purposes.

Table 2. CH_4 lifetime (in years) as computed by the CTMs listed in Table 1.

	Range	Median
Global Lifetime	6.4-10 (15*)	7.5
NH	5.8-9.1 (14*)	6.9
SH	7.1-10.3 (19*)	8.6

• only one model result, not taken into account for the median calculation.

Inverse Methods in Global Biogeochemical Cycles as a joint effort between the IGBP Global Analysis, Interpretation, and Modeling (GAIM) Framework Activity and GIM. The main objective of this workshop will be to teach students entering the field about the mathematics of inverse problems and the issues of *a priori* constraints. The long-term benefit will be more experienced researchers who will be able to address some of the outstanding problems in global biogeochemical cycles with the proper scientific tools. The workshop is currently planned for March 16-20, 1998, in Crete, Greece. The workshop will follow a format of invited expert lectures, as well as practical problem-solving exercises. It is anticipated that the expert lectures will be printed in a book together with the practical examples and their solutions. Potentially, both the problems and the software will be made available in electronic form (e.g., as a CD-ROM) together with the book.

It is anticipated that other topics such as heterogeneous reactions in the atmosphere and biosphere/atmosphere interactions will be the focus of future GIM activities. Such activities will involve a close coordination between GIM and other related activities of IGAC and IGBP.

GIM Leadership

The current Co-Convenors of GIM are Dr. Maria Kanakidou and Dr. Prasad Kasibhatla (e-mail: psk9@duke.edu). The other inaugural members of the GIM Coordinating Committee are: Carmen Benkovitz, USA , Frank Dentener, The Netherlands, Laura Gallardo-Klenner, Chile, Claire Granier, France & USA, Ivar Isaksen, Norway, Jack Kaye, USA, Kathy Law, UK, Jennifer Logan, USA, and Jack McConnell, Canada. This Committee will be expended in near future to include scientists from Asia, Australia, and other locales.

Summary of the Workshop on "Perspectives in Atmospheric Chemistry"

Contributed by Shyam Lal, Physical Research Laboratory, Ahmedabad 380 009, India

A workshop on "Perspectives in Atmospheric Chemistry" was organized at Physical Research Laboratory (PRL), Ahmedabad, on December 26-27, 1996. About sixty participants from Germany, the USA, and various institutes/universities in India participated in this workshop. Professor Paul Crutzen, recipient of the 1995 Nobel Prize in Chemistry and Director, Max Planck Institute for Chemistry, Mainz, Germany; Professor Dieter Kley, Director, Institute for Chemistry-II, Jülich, Germany; Dr. P.K. Bhartia, Head, Atmospheric Chemistry and Dynamics Branch; and Dr. V. Mehta, Chairman, NASA/UMD, Joint Centre for Earth System Science, both from GSFC/NASA, USA were the foreign participants. The workshop was inauguarated by Professor C.N.R. Rao, President, Jawaharlal Nehru Centre for Advance Science Research, Bangalore, and the keynote address was given by Professor Crutzen.

There were four scientific sessions covering (i) Atmospheric Chemistry and Climate, (ii) Greenhouse Gases: Fluxes and Trends, (iii) Cloud Chemistry and Aerosols, and (iv) Trace Gases and Changes in Stratospheric Ozone. Each session began with a lead talk of 40 minutes duration followed by other presentations of 20 minutes each. A total of 19 detailed presentations were made during the two day period.

Participants of the workshop were happy to note that a good deal of work related to atmospheric ozone, trace gases and aerosols is being carried out in India. A number of lidar systems, in addition to other optical systems, are being used to study aerosols in India. The ozonesondes used by the India Meteorological Department (IMD) showed good agreement with other ozonesondes during an international intercomparison experiment conducted at Jülich, Germany. The integrated methane flux from Indian rice fields is estimated to be about 4 Tg/yr only. Measurements of N_2O in the Arabian sea show that this gas is being

emitted into the atmosphere during most of the year. The annual flux is estimated to be about 0.6 Tg N_2O per year. Studies based on GCMs show that while increase in CO_2 enhances rainfall in the Indian subcontinent, incorporation of sulfate aerosols in the model results in the decline of rainfall.

The role of the tropical regions in the chemistry of the global atmosphere was highlighted. The importance of the tropical region lies, apart from many natural factors, in the fact that most of the current and future industrial developments are taking place in this part of the world. This region will witness the maximum environmental and atmospheric changes. The need to study the vast biosphere and the tropospheric chemistry in the tropical region was stressed. The Indian Ocean Experiment (INDOEX) scheduled for 1998-99 is one such experimental program which is designed to study the radiative-chemical processes in this region.

It was suggested that developing countries should collaborate with the developed countries. Joint development of payloads for Indian satellites for atmospheric research was also suggested. There is a need for extensive tropospheric ozone measurements using balloonborne ozonesondes and lidars in view of the increasing abundances of new substitutes for CFCs and other pollutants from industrial development.

Announcements

International Symposium on Atmospheric Chemistry and Future Global Environment

Nagoya, Japan - November 11-13, 1997

Organized by the Science Council of Japan and the National Space Development Agency

Objectives

According to human activity, chemical composition of the atmosphere has been changing rapidly. Increase of the concentrations of greenhouse gases, oxidants and aerosols is a direct cause of global environmental change. Atmospheric chemistry which aims to study the global change of the atmosphere is a rapidly growing research field and better communication of scientists worldwide is essential for successful achievement of IGAC and IGBP. The purpose of this IGAC/IGBP symposium is to summarize and enhance our knowledge of current acidity of atmospheric chemistry and future global change, and to enhance communication between scientists in Asia and the rest of the world in this field.

General Information

The Symposium will be held at Nagoya Congress Center. The registration fee is 10,000 Japanese Yen (approx. US$90) including extended abstracts of the Symposium and reception.

Special Guest Speaker: Dr. Paul Crutzen
Max-Planck-Institut für Chemie, Germany

Symposium Publications

A volume of extended abstracts will be distributed at the Symposium.

Discussion Themes

Session 1: Material Cycles of Greenhouse Gases (Convener: T. Nakazawa, Touhouku University)
Session 2: Tropospheric Photochemistry and Ozone Budget (Convener: Y. Kondo, Nagoya University)
Session 3: Aerosols and Their Climate Impact (Convener: K. Kawamura, Hokkaido University)

Important Deadline

15 September 1997 Extended abstracts

Executive Committee Officers

H. Akimoto (University of Tokyo) Chair
T. Ogawa (University of Tokyo) Vice Chair
Y. Kajii (University of Tokyo) Secretary

For registration information, please contact:

Dr. Yoshizumi Kajii
RCAST, University of Tokyo
4-6-1 Komaba, Meguro-ku, Tokyo 153, Japan
Tel: (+81-3) 3481-4563
Fax: (+81-3) 3481-4562
Email: kajii@atmchem.rcast.u-tokyo.ac.jp

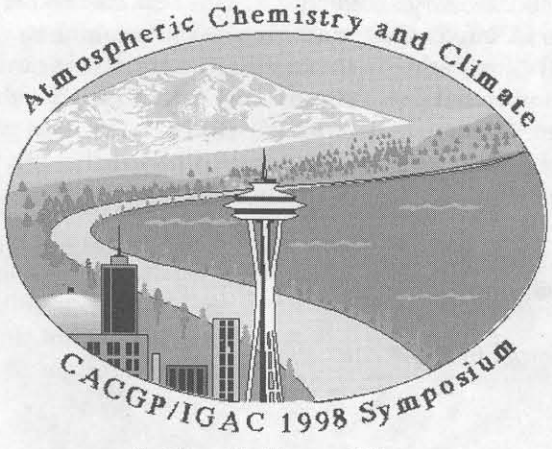
Atmospheric Chemistry Inventories Session at the American Geophysical Union 1997 Fall Meeting December 8-12, 1997

Source and sink inventories for trace compounds are widely employed in studies of atmospheric chemistry to constrain budgets, differentiate source types and distributions, resolve details of atmospheric processing, provide input data for models, and to identify gaps in our understanding. In recent years, IGAC's *Global Emissions Inventory Activity* (GEIA) has helped coordinate much of this work within a systematic structure. This session will provide a forum for presenting recent results in this increasingly important area of atmospheric research. We solicit papers reporting inventories for a broad spectrum of compounds relevant to atmospheric chemistry and biogeochemical cycles, as well as for associated, underlying data bases. Abstract deadline is September 3, 1997.

For further information contact the session Conveners: Jürgen M. Lobert, C^4/SIO/UCSD, 9500 Gilman Drive #0239, La Jolla, CA 92093-0239, USA, Tel: (+1-619) 822-0297, Fax: (+1-619) 534-4922, Email: jurgen@fiji.ucsd.edu; and William C. Keene, University of Virginia, Dept. of Environmental Sciences, Clark Hall, Charlottesville, VA 22903, USA, Tel: (+1-804) 924-0569, Fax: (+1 804) 982-2300, Email: wck@virginia.edu.

Joint International Symposium on Global Atmospheric Chemistry

UPDATE



Ninth Symposium of the IAMAS Commission on Atmospheric Chemistry & Global Pollution (CACGP)

and

Fifth Scientific Conference of the International Global Atmospheric Chemistry Project (IGAC)

Seattle, Washington, USA
19-25 August 1998

For further information, contact:

Dr. Patricia Quinn
CACGP/IGAC Meeting - 1998
NOAA/PMEL/OCRD
Building 3
7600 Sand Point Way NE
Seattle, WA 98115
USA
Fax: (+1-206) 526-6744
Email: quinn@pmel.noaa.gov

Or access the Symposium web site at

http://saga.pmel.noaa.gov/cacgp98/

Important Note:

The 1998 American Meteorological Society Conference on Cloud Physics is currently planned for the Seattle area from August 17-21, 1998. The conference is timed to partially overlap the CACGP-IGAC Symposium on Global Atmospheric Chemistry. Cloud and Precipitation chemistry sessions at the Cloud Physics Conference will be scheduled on 17-18 August so that scientists interested in these disciplines can attend both the AMS and CACGP-IGAC conferences. Information about the Cloud Physics conference can be obtained from the Program Chairman, Dr. Bob Rauber (r-rauber@uiuc.edu), or by accessing the conference web site at:

http://www.atmos.uiuc.edu/cloud_phys_conf/

1998 WMO-IGAC International Cloud Chemistry Modeling Meeting

It is well recognized that the accurate simulation of the physical and chemical processes in clouds is critical to our understanding and representation of atmospheric chemistry and global climate. The 1996 WMO Cloud Modeling Workshop in Clermont-Ferrand, France, included a focus on cloud chemistry for the first time. A full report on the details of the workshop and its findings will be available from WMO in 1997. In short, the cloud chemistry group was successful in developing the process and found it to be worth continuing. Consequently, a follow-up meeting of the cloud chemistry group will be held in late September or early October of 1998 in Nova Scotia, Canada. The meeting will be conducted in sequence with the WCRP-IGAC Workshop on Large -Scale Models Simulating Atmospheric Sulfate Aerosols Intercomparison Workshop (see accompanying announcement). Details of the large-scale model workshop can be obtained from Len Barrie at len.barrie@ec.gc.ca). The objectives of the cloud chemistry meeting are as follows:

- To bring together cloud chemistry modelers and data collectors in a common forum
- To examine model intercomparisons based on common observational data inputs, and perform comparisons of simulations with observations
- To highlight current cloud chemistry issues to aid in the direction of future field measurements and modeling efforts

Modeling Scales

The WMO cloud modeling workshops have traditionally focused on simulations of the mesoscale and smaller, and the 1998 meeting will focus on regional scales down to the microscale. It is hoped that this focus will provide a good complement to the Large -Scale Model Intercomparison Workshop that will address issues related to aerosols.

Datasets

The datasets to be used were obtained during the 1993 intensive measurement period of the North Atlantic Regional Experiment (NARE). Many of the datasets are described in the NARE special section of the *Journal of Geophysical Research - Atmospheres* (**101(D22)**, Dec., 1996). Two cases will be considered for intercomparison. Case One will deal with the influence of cloud-top reflectance on photochemistry above low marine stratus. Data from the NCAR King Air are used for initialization, and the Canadian IAR Twin Otter data are used to examine the evolution of O_3 and H_2O_2. Case Two will examine the role of S(IV) oxidation in the low stratus on changes in the size distribution of the atmospheric aerosol. Airborne and ground-based data collected just prior to the development of low marine stratus are used for initialization. Data from the same platforms collected at later times will be used to examine the evolution. The initialization and evolution data for both cases, in addition to the complete Twin Otter dataset, are available at http://www.on.doe.ca/armp/NARE/NARE.html under WMO9854.

To participate or for further information, please contact either Andrea Flossman (flossman @opgc.univbpclermont.fr) or Richard Leaitch (leaitch@armph3.tor.ec.gc.ca).

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1998 WCRP-IGAC Workshop on: A Comparison of the Performance of Large Scale Models in Simulating Atmospheric Sulfate Aerosols

Three-dimensional models of atmospheric trace constituents currently abound since they are important tools in understanding climate, stratospheric ozone depletion, tropospheric oxidants and acidification of ecosystems. An indication of the level of interest in this area is that 13 groups ran the CFC-11 test problem for the WCRP Scientific Symposium on Global Tracer Transport Models in 1990 which was the first workshop in a series. The second workshop in 1993 on Parameterization of Sub-grid Scale Tracer Transport involved 22 models running a ^{222}Rn experiment. In 1995, 15 models were run for a third workshop on the Transport and Scavenging of Trace Constituents by Clouds in Global Atmospheric Models. Current interest in the role of aerosols and in climate makes the processes of chemical transformation in clear air and in clouds, precipitation scavenging, dry deposition and stratospheric-tropospheric exchange especially important. Sulfates are generally believed to be major aerosol constituents that are radiatively important. Significant quantitative uncertainties persist in our understanding of their distribution and of the factors that control it.

The community of modelers currently interested in these processes are divisible roughly into two groups, namely, modelers who are attempting to include aerosols as interactive constituents in climate models and atmospheric chemical transport modelers who are trying to understand the chemical formation, physical transformation and scavenging pathways of these constituents using models driven off-line by climate-model-generated or observed winds (analyzed winds). Although there are exceptions, the former move in WCRP Working Group on Numerical Experimentation (WGNE) circles while the latter are generally concentrated in the Global Integration and Modeling (GIM) Activity of IGAC. In both modeling approaches, the processes of trace constituent transport, transformation and removal are parameterized with varying degrees of sophistication. There is a need to bring the two groups together to utilize the expertise of each to the advantage of all.

It is proposed that a joint WGNE-GIM workshop of about 40 people be held in late September or early October of 1998 in Nova Scotia, Canada. The meeting will be conducted in sequence with the 1998 WMO-IGAC International Cloud Chemistry Modeling Meeting. The objectives are as follows:

1. Compare model-predicted distributions of atmospheric sulfate aerosols and associated precursors (e.g. DMS, SO_2) with regional sulfur budgets, observations at ground level and in the vertical.

2. To understand which processes are contributing to differences in the models and observations (i.e., boundary layer mixing, vertical convection, chemical/physical transformation and precipitation scavenging).

To participate or for further information, please contact the chair of the organizing group L.A. Barrie (len.barrie@ec.gc.ca).

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Editor, Alex Pszenny; Layout and Proofing, Elaine Robbins; Logos by Linda Kubrick

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The IGAC Core Project Office, MIT, Bldg. 24-409, Cambridge, MA 02139-4307, USA
Tel: (617) 253-9887, Fax: (617) 253-9886, Email: erobbins@mit.edu,WWW: http://web.mit.edu/igac/www/

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