NARSTO News

A North American Consortium for Atmospheric Research in Support of Air-Quality Management

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http://www.cgenv.com/Narsto

NARSTO Completes Third Aerosol-Research Planning Workshop

NARSTO recently completed its third workshop for fine-particle research, which was held in Crystal City, Virginia on January 27 -29. This meeting's central objective was to acquire a broad information base from the scientific community, which will be used as input for a forthcoming Strategic Execution Plan (SEP) on aerosol research. NARSTO's current SEP ensemble contains three volumes, dealing with: 1. programmatic overview, 2. ozone assessment, and 3. ozone research. The aerosol research plan will form Part 4 of this series, and will be posted on the NARSTO Web site along with its earlier counterparts.

NARSTO focuses exclusively on physical-science aspects of air pollution. In so-doing, however, it recognizes the important linkages between its research products and its user communities, including those associated with biological effects, policy development, and regulatory implementation. Reflecting these linkages, the workshop focussed on developing a program design that optimizes downstream utility of its aerosol-research products. The health-effects community is a particularly important user group in this regard. In reflection of this, several prominent health scientists were invited to co-chair individual workshop sessions, with the mission of ensuring that the physical-science — health-science linkage is "designed in" as an underlying structural component of the NARSTO plan.

As indicated by the "wiring diagram" on page 3, this workshop emerges at the conclusion of an extended chain of planning components, connected by information-flow pathways. In essence, this chain began with an initial, DOE-hosted workshop in September 1997, which provided a preliminary screening of current research needs in the atmospheric aerosol arena. Significantly, this workshop emphasized the need for strong ties with health-effect researchers, and recommended that the health-effect community conduct a second,

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NARSTO Welcomes New Members

Recently two new organizations have joined as Supporting Members of the NARSTO organization. The first of these, the Ontario Ministry of the Environment, has participated extensively in past atmospheric research efforts, and can be expected to be a strong contributor to the future ozone and particulate-matter research agenda. Dr. P. K. Misra and Dr. James MacLean will serve as key contact persons there.

The second new organization, the New York State Energy Research Authority, is truly new. Formed as a component of New York's recent electric utility restructuring process, the organization will manage future associated research efforts for the state. Dr. Joseph Visalli and Ms. Janet Joseph will be key contact persons for the Authority.

NARSTO welcomes both of these organizations to our consortium, and looks forward to working with them during future years.

Aerosol Workshop . . ., Continued

companion workshop in the near future.

Several health scientists attending this NARSTO meeting noted that, despite plausible epidemiological evidence suggesting significant health impacts of fine aerosol particles, little direct information currently is available pertaining to specific causal agents or pathways. Such uncertainty complicates the design of an appropriately responsive atmospheric-research program. In view of this, the NARSTO community requested the health scientists to compile, from their own perspective, a "ten most-wanted list" for atmospheric research efforts for NARSTO's use in its initial scoping effort.

The Health community conducted its own, companion workshop during the following November. In addition, the U.S. National Academy of Sciences, under EPA support, formed its Committee on Research Priorities for Airborne Particulate Matter. The first product of this committee was a formal NAS report, entitled *Research Priorities for Airborne Particulate Matter*. Known widely as the "burning bush" document because of its red/orange cover, this report provides an initial conceptual framework for an integrated, national program of particulate-matter research. A second, follow-on document is expected some time during midwinter of 1999.

A major information-convergence point occurred during July 1998 at an EPA-hosted workshop on particulate-matter measurement-network design, which was conducted as a joint effort by NARSTO and the health-research community. Although several major products emerged from this workshop, its's listing of the following eleven physiological-response agents associated with fine particles is especially noteworthy:

Particulate Matter Mass Concentration
Particulate Matter Size/Surface Area
Ultrafine Particulate Matter
Metals
Acids
Organic Compounds
Biogenic Particles
Sulfate and Nitrate Salts
Peroxides
Soot
Cofactors

This listing is discussed in more detail in the workshop report *Atmospheric Observations: Helping Build the Scientific Basis for Decisions Related to Airborne Particulate Matter*. Copies of this report were distributed at the January 27 - 29 Crystal City Workshop, and can be obtained from the NARSTO Management Coordinator's office upon request.

In conclusion, the NARSTO planning workshop represented a convergence of multiple information channels, and was designed to further enhance the scientific linkages between the atmospheric- and health-science communities. An extended synopsis of the meeting results is available on the NARSTO Web site.

The *NARSTO News* is published biannually for the purpose of communicating NARSTO activities and progress to members of the extended NARSTO community. Persons wishing to comment on the newsletter or submit material for publication are invited to do so by contacting either Diane Fleshman or Jake Hales in the NARSTO Management Coordinator's office, at the following address:

NARSTO Management Coordinator's Office
60 Eagle Reach
Pasco, WA 99301

Phone: 509/546-9542
e-mail: narsto@odysseus.owt.com

NARSTO Ozone Assessment Continues On Course

During late December the NARSTO Synthesis Team completed its most-recent draft of the Ozone Assessment Document, and forwarded it to the National Academy of Sciences and to NARSTO's executive membership for review. Comments from these reviews are expected back in May, leading to preparation of the final document.

Meanwhile, the majority of the Assessment's Critical Review Papers have cleared the editorial review process for publication in the forthcoming dedicated issue of *Atmospheric Environment*. A few of the submitted papers were not accepted, primarily because of manuscript length, and we are currently considering alternative publication

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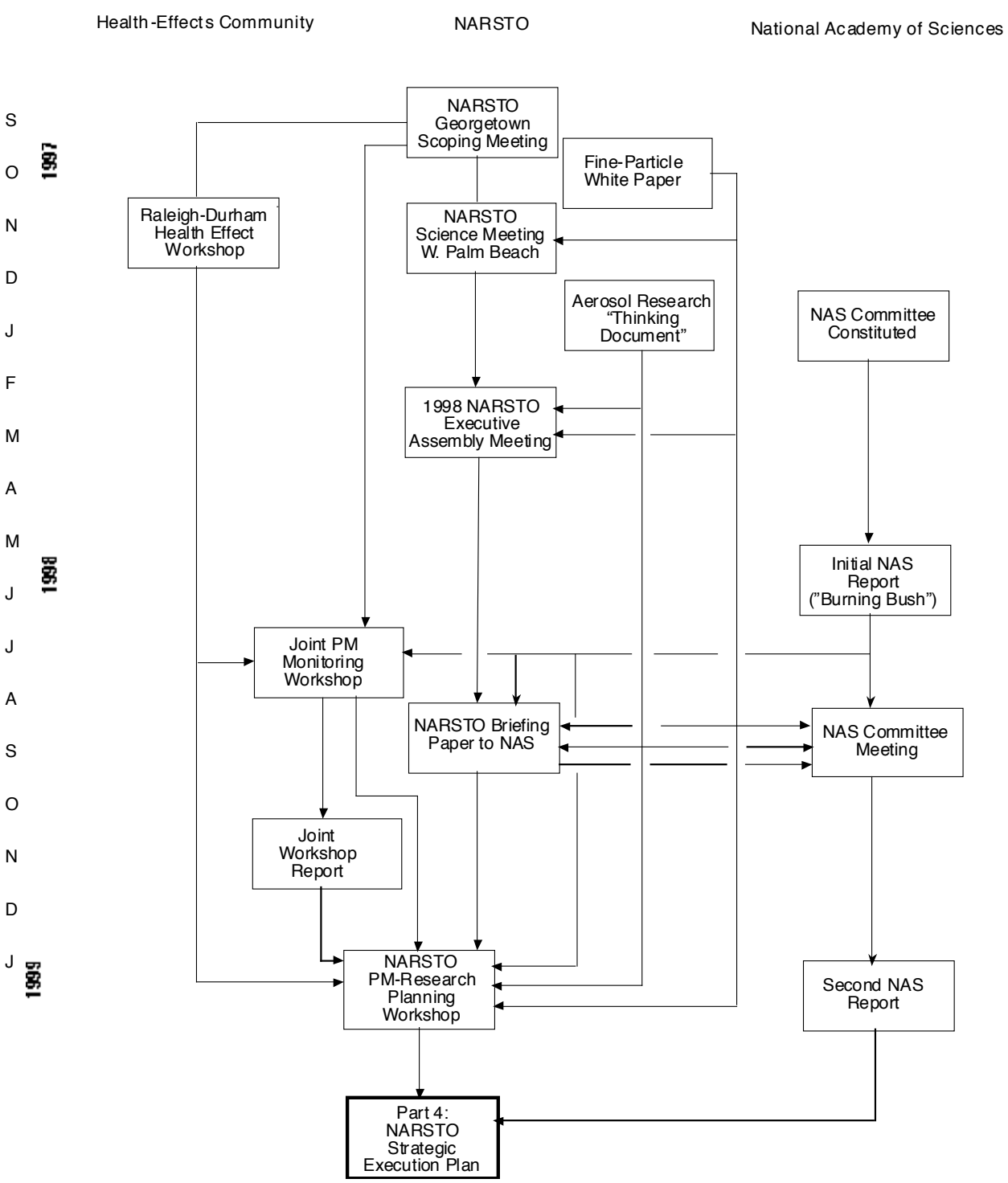
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NARSTO Georgetown Scoping Meeting
Fine-Particle White Paper
Raleigh-Durham Health Effect Workshop
NARSTO Science Meeting W. Palm Beach
Aerosol Research "Thinking Document"
NAS Committee Constituted
1998 NARSTO Executive Assembly Meeting
Initial NAS Report ("Burning Bush")
Joint PM Monitoring Workshop
NARSTO Briefing Paper to NAS
NAS Committee Meeting
Joint Workshop Report
NARSTO PM-Research Planning Workshop
Second NAS Report
Part 4: NARSTO Strategic Execution Plan

Ozone Assessment . . . *Continued*

media for these contributions.

Download copies of the draft Assessment Document and the Critical Review Papers are available on the NARSTO Web site. Final publication of the Assessment Document and the *Atmospheric Envi-*

NARSTO Executive Assembly Meeting Held During January

NARSTO held its annual Executive Assembly/ Executive Steering Committee (EA/ESC) meeting on January 29, in Arlington, Virginia. The primary intent of this meeting was to review 1998 progress on key NARSTO initiatives, with particular emphasis on the Ozone Assessment, fine-particle research planning, and the NARSTO Charter revision.

The meeting also installed it's new ESC Public Sector Co-Chair, Don McKay, and confirmed appointment of its new Private Sector Co-Chair - Elect, Howard Feldman. Don, from Environment Canada's Atmospheric Environment Service, replaces outgoing Co-Chair Michelle Broido (see article, this page). Howard, from the American Petroleum Institute, will assume official Co-Chair duties at the 2000 EA/ESC meeting.

Minutes of the January 1999 EA/ESC meeting are available on the NARSTO Web site.

Words from the New Co-Chair: A Future Vision for NARSTO

Upon accepting the Public-Sector Co-Chair manship at the January EA/ESC meeting, Don McKay outlined several areas that he will emphasize during his two-year term of office. As a first priority, Don plans to push NARSTO towards becoming a more balanced international organization by actively recruiting additional members from both Canada and Mexico. Secondly, Don will work to promote an efficient and "seamless" interface between activities in NARSTO's ozone and particulate-matter agendas. In so-doing Don hopes to increase NARSTO members' "ownership" in the organization by creating visible and useful products, and encouraging widespread consensus management of operations. NARSTO needs to work hard to communicate these results to our membership and to the external stakeholder community, and Don plans to promote and encourage these communication pathways.

A strong tri-national emphasis is especially important from a resource-sharing standpoint, and Don plans to actively encourage international cooperation in the areas of resource and knowledge sharing, field endeavors, and model application/ development.

Finally, Don emphasized his open-door policy to NARSTO leadership, and requested that members contact him frequently concerning their ideas and suggestions for program improvement. Don plans a proactive role in this regard, where he will travel to key NARSTO sites frequently in performance of his Co-Chair duties: Don't be too surprised if you see him knocking at your door!

Michelle Broido Moves to Pitt Health Sciences Position

Shortly after completing her term as ESC Co-Chair, Michelle Broido announced her appointment as Assistant Vice Chancellor for Research in Health Sciences at the University of Pittsburgh.

Michelle was well known — and much appreciated — for her realistic, "down to business" approach on NARSTO activities. Among her many contributions, she played a leading role in establishing NARSTO's Quality Systems and Data Management operation. She also set up and implemented NARSTO's infrastructure fund repository at the Oak Ridge Institute for Science and Education.

We'll miss Michelle in NARSTO, and we wish her well in her new role at Pitt.

NARSTO Reactivity Research Working Group Moves Forward

On March 24 and 25 NARSTO's Reactivity Research Working Group (RRWG) met in Research Triangle Park, North Carolina, in its most recent of a scheduled series of meetings. Designed to move the programmatic effort ahead from a planning stage to an active scientific-accomplishment phase, these meetings and RRWG supporting efforts have produced two white papers, dealing with science and policy aspects of the reactiv-

ity issue. The science white paper is available in draft form on the NARSTO web site, and the policy paper will be placed there shortly. These papers will form the scientific basis for a formal research plan, which will be prepared in the near future.

The March meeting accomplished a major organizational goal with the installation of Dr. Donald Fox as RRWG Chairman. A physical chemist by training, Don is Professor, and Acting Chair, in the Environmental Sciences and Engineering Department at the University of North Carolina at Chapel Hill.

The RRWG Organizing Committee, led by Co-Chairs Robert Wendoll and Basil Dimitriades, completed its intended functions and formally dissolved upon Don's Appointment. A new "steering committee" group is expected to be named in the near future.

The RRWG's next meeting is scheduled for June 9 and 10, and will be held either in RTP, North Carolina or Southern California, depending on collocation arrangements with other meetings. The time and place of the meeting will be posted on the Web site as soon as they are established.

The NARSTO Model Evaluation: Reducing the Knowledge Gap by Comparing Regional Modeling Systems

Several regional-scale modeling systems are in current use for assessing ozone air-quality management issues in North America. Many of the modeling domains and time periods simulated by these systems are nearly the same or overlap. Because the results of these assessments can have profound health and economic ramifications, we might wonder "If the results don't agree with one another, then which (if any) do we believe?" Stimulated by such questions and capitalizing on the opportunity afforded by the noted coincidence of modeling domains, a group of NARSTO participants, spearheaded by Dr. Maris Lusis of Environment Canada, has initiated a series of head-to-head comparisons and diagnoses of the modeling systems' simulation skill.

Following a May 1998 NARSTO planning workshop, a group of scientists wrote a formal science proposal for the intercomparison project, which was subsequently reviewed and approved by the NARSTO Executive Steering Committee. The proposed scope of work, which focuses primarily on ozone, is divided into two stages. Each stage involves multiple-model simulations for common spatial domains and time periods, coinciding with the summer 1995 NARSTO-Northeast/NARSTO Canada-East study and the Nashville/Middle Tennessee ozone study, whose measurements will be used as a comparative data base. The first stage, currently in progress, allows the use of individual, user-selected model configurations and inputs. To conclude this stage, the models' relative and absolute abilities to simulate the observed conditions will be evaluated and their comparability established. These results are expected to be an important information resource for establishing the relative reliability of assessment results.

The second stage, expected to begin in late 1999, will be much more ambitious. In contrast to the relatively "free-form" initial stage, this stage will prescribe mutually agreed-upon "harmonized" model inputs, with the objective of minimizing the number of factors that may contribute to differing inter-model performance.

Because several of the modeling systems will be able to simulate aerosols in the near future, comparisons of model skill in simulating secondary fine particles may be included in this effort. In any case, the linkages between ozone and secondary fine particles renders findings from this ozone-focused study potentially applicable to future aerosol-modeling efforts.

Stage II comparisons will be made of 1) relative and absolute model performance with respect to simulated key variables; 2) the simulated responses of ozone and other gases to ozone precursor (NO_x and VOC) emission changes; 3) transboundary fluxes derivable from the wind fields and pollutant mixing ratios; and 4) process-level information on the relative contributions of specific pathways to the concentrations and phenomena of interest. This stage should lead to a significantly enhanced understanding of the models' relative responsiveness to changes in precursor emissions and the reasons for model-to-model differences.

After the Stage I modeling is complete and the results consolidated, a workshop will be held for discussing the results of Stage I comparisons, identifying items for further investigation, establish-

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Model Evaluation . . . , *Continued*

ing the feasibility of proceeding to Stage II, and developing the Stage II protocol. Similarly, at the conclusion of Stage II modeling a workshop will be held to review and refine the results, identify and share lessons learned, and agree on priorities for pursuing further model improvements.

Detailed procedures for conducting the comparisons and evaluations are under development by three workgroups, dealing with meteorological modeling, emission modeling, and air-quality modeling. Completion of the two-stage study is planned for late 2001.

Funds for Stage II are not yet in-place, and project participants are actively seeking sponsors for key project components. Copies of the proposal and/or the Stage I Protocol are posted on the NARSTO web site (http://www.cgenv.com/Narsto). NARSTO organizations interested in supporting specific project components should contact the project coordinator:

Alan Hansen
EPRI
P.O. Box 10412
3412 Hillview Ave.
Palo Alto, CA 94303
phone: 650-855-2738
fax: 650-855-2950
ahansen@epri.com

NARSTO News *contribution by Alan Hansen*

Update on Quality Systems and Data Management Activities

The following sections announce the availability of NARSTO products and update the status of NARSTO Quality Systems Science Center (QSSC) activities. These items reflect the continuing role of the QSSC to (1) provide quality systems and data management guidance to NARSTO projects and to (2) quality-assure, document, and transfer NARSTO data to the Permanent Data Archive.

Measurement Methods Compendium Now Available

The QSSC is pleased to announce that the NARSTO Measurement Methods Compendium web site is now available for review and reference at the following URL:

http://narsto.esd.ornl.gov/Compendium/

The QSSC is developing the NARSTO Measurement Methods Compendium to be a clearinghouse for atmospheric measurement techniques for ozone, ozone precursors, aerosol precursors, particulate matter, and meteorological parameters. The first set of method descriptions is presented for review and comments at the above URL. The current focus is on the FRM/FEM methods for ozone, NO_2, CO, PM_{10} and $PM_{2.5}$ to provide a well-documented basis from which to evaluate and improve the scope, content, usefulness, and presentation style of the method descriptions. Your technical reviews and user feedback are needed. Please send any questions and comments to the QSSC.

The Compendium is intended to be a convenient reference source for both tried-and-true and state-of-the-art atmospheric measurement techniques. The compendium will cover measurements made by in situ and remote sensing techniques, continuous and discrete measurements, and is intended to support method applications ranging from routine monitoring at the state or county level to the latest R&D methods. Methods descriptions are provided as a service to NARSTO scientists selecting methodologies and preparing standard operating procedures for their projects, as a general reference to the extended atmospheric science community, and as a resource to potential developers of new technologies.

NARSTO NE Model Verification Data are Now Available

The NARSTO 1998 Model-Intercomparison Study Verification Data: NARSTO-Northeast 1995 Surface Ozone, NO, and NO_x are now available at the NARSTO Permanent Data Archive at the NASA Langley DAAC. Instructions for accessing the data are available on the QSSC web site. These are the first NARSTO data available on the Permanent Data Archive. The QSSC performed several quality assurance checks on the NARSTO-NE 1995 data, and formatted and documented the data files.

This data set supports the NARSTO Model Intercomparison activity described in the report of a workshop that was held in Washington, DC during May 1998 (see previous article). The intercomparison activity will compare the meteorological, emission, and air-quality models used to estimate ozone concentrations in the Northeastern United

States. These data are a subset of the measurements made during the NARSTO-Northeast 1995 intensive field campaign and will be used to verify model predictions. Included are surface one-hour average O_3, NO, and NO_X measurement results from all reporting sources for 1995. ASCII data files are available for specific time intervals and the full monitoring period. A measurement station description/location file and a data description file are included.

Quality Management Documents Updated

The ***NARSTO Quality Systems Management Plan (QSMP)*** has been updated to reflect the recent expansion of the NARSTO mission to encompass particulate matter research and the ***NARSTO Data Management Handbook*** has been updated to clarify the implementation of the Data Exchange Standard archive format. Both documents are available on the QSSC web site.

QSSC Interactions:

Workshop on Fine-Particle Characterization and Atmospheric-Process Research, January 27-29, 1999

Posters presented at the recent workshop by QSSC staff are displayed on the QSSC web site.

Atmospheric Environment Service, Environment Canada

Special thanks to Mr. Bill Sukloff, QS/DM Committee Member, with the Atmospheric Environment Service, Environment Canada. Bill visited the QSSC at the Oak Ridge National Laboratory for two weeks in mid-September. He provided the QSSC with software that he has developed to process and quality assure data in the NARSTO Data Exchange Standard (DES) format. The DES uses self-documenting ASCII files that allow easy access to the measurement data and metadata. Future data provided by the QSSC to the NARSTO Permanent Data Archive at the NASA Langley DAAC will use the DES.

Data Standard Presentation at World Data Center Managers Meeting

Tom Boden, QSSC Data Coordinator, presented an overview of the NARSTO Data Exchange Standard at the World Data Center (WDC) Managers Meeting held September 21-25, 1998 at the Norwegian Institute for Air Research (NILU) in Kjeller, Norway. The meeting was sponsored by the World Meteorological Organization's (WMO) Global Atmospheric Watch (GAW) Program. The WMO WDC system consists of six data centers including two centers handling atmospheric ozone measurements. The WMO WDCs are considering the adoption of a single data exchange standard to ease submission pressures for individual monitoring stations and to increase data harmonization across the WMO WDC system. The NARSTO Data Exchange Standard is being evaluated by the WMO WDC directors. A final decision on whether a standard should be adopted and if so, which one, will be reached by the directors in 1999.

California Regional PM10/PM2.5 Air Quality Study (CRPAQS)

The QSSC is interacting with CRPAQS Project Manager, Karen Magliano, and reviewing RFPs, QA, data management, and field program plans. NARSTO quality management system guidance has been incorporated into CRPAQS program plans. We believe this is a good model for other projects to follow in the future.

QSSC Organizational Changes

Mr. Tom Boden is phasing out as the QSSC Data Management Coordinator. Dr. Sig Christensen is the new Coordinator and will be assisted with data processing by Ms. Linda Allison. Dr. Meng-Dawn Cheng continues as the Chief Scientist, and Dr. Les Hook is the QA Coordinator and Director. Check the QSSC web site for contact information or call Les at 423-241-4846.

NARSTO News *contribution by Les Hook*

PROPHET Obtains a Unique Dataset on Natural VOC Emissions and Reactivity

PROPHET (Program for Research on Oxidants: PHotochemistry, Emissions, and Transport), initiated in 1996, is the primary atmospheric chemistry research activity at the University of Michigan Biological Station (UMBS) and is an official NARSTO activity. Mary Anne Carroll is Director of PROPHET, and Science Team members include Drs. Bertman (Asst. Program Director), Brune, Curtis, Honrath, Moody, Schmid, Shepson (Asso. Program Direc-

(Continued on page 8)

PROPHET, . . . *Continued*

tor), Teeri, Westberg, Young and Zika. A major research objective of PROPHET is to improve the understanding of the chemistry and climatology of ozone formation, which is directly linked to biogenic emissions of reactive hydrocarbons (e.g. isoprene and terpenes). PROPHET research projects are currently supported by externally funded grants from NSF, EPA, and the University of Michigan.

During its 1998 summer campaign at the UMBS, which is located near Pellston, at the northern tip of Lower Michigan, PROPHET collected a valuable new dataset associated with emission and reaction of biogenic VOCs. A brief scientific background and description of these measurements is described below.

Despite the fact that much is understood about the interactions between sunlight, nitrogen oxides ($NO_X = NO+NO_2$), and volatile organic compounds (VOCs) that result in the formation of ozone (O_3) and other oxidants in the troposphere, regulatory attempts to control urban and even rural O_3 levels largely have been unsuccessful. Increases in the number and frequency of rural areas exceeding the North American Air Quality Standards (NAAQS) for O_3 and fine particulates are expected as a result of the stricter definitions for non-attainment for these pollutants. Furthermore, evidence for hemispheric increases in tropospheric photochemical oxidants and aerosols is in hand, and it is believed that background surface-levels of O_3 have doubled globally and have increased by a factor of 4 or 5 in the Northern Hemisphere since the pre-industrial era.[1]

Regional air pollution episodes in summer typically occur as a result of slow-moving high-pressure systems that result in stagnation that allows pollutant build-up. Elevated levels of NO_X and O_3 have been observed at the UMBS under such conditions. Indeed, the Lake Michigan Ozone Study was undertaken in response to pollution episodes downwind of the urban and industrialized southern "mixed" layer above Lake Michigan, leading to enhanced oxidation.[2] It is vital to further characterize such events, in particular to evaluate the contribution of substantial levels of biogenic VOCs to the otherwise anthropogenic mix arriving from southwest of the site, with respect to O_3 formation and the export of O_3 and its precursors to the Northeastern United States and to Canada.

Formulation of effective control strategies requires a quantitative understanding of the interplay between individual physical, chemical, and biological mechanisms that determine formation, loss, and distribution. Greater understanding requires focused process studies involving carefully integrated modeling and measurement activities that include anthropogenic and biogenic emissions, gas- and aqueous-phase trace species, particulates, and meteorological parameters. The results of such studies will have wide applicability. These activities are being pursued by PROPHET researchers, a consortium of scientists from over 20 institutions, through an integrated set of intensive measurements at the UMBS combined with trajectory modeling, the application of appropriate chemical transport models and, when possible, aircraft measurements between Pellston and upwind source regions. Some of the key objectives motivating PROPHET researchers are to address the following questions:

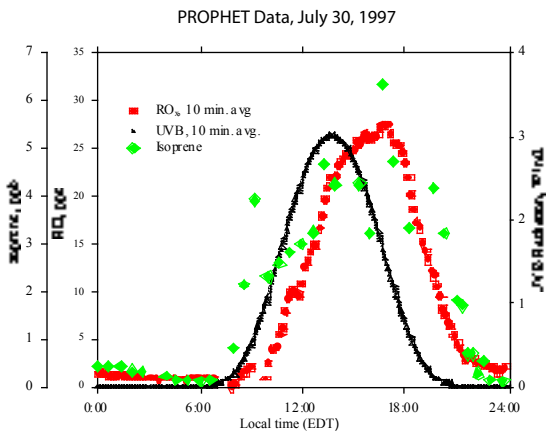
- How does the NO_x-sensitivity of the O_3 production rate depend on ambient atmospheric conditions and composition?
- How do biogenic emissions control the concentration of tropospheric O_3?
- How does oxidant chemistry influence aerosol production, and how do aerosols influence oxidant precursors?
- How does long-range transport influence the regional ambient concentrations of O_3, its precursors, and fine particulate matter?
- To what extent do models simulate the details of O_3 and aerosol chemistry and transport?

PROPHET has developed significant infrastructure at UMBS for atmospheric chemistry research. Most instrumentation is housed inside a 20'x20' air conditioned laboratory building supplied by 150 Kw power. A separate pump room with independent cooling is vented 200 m downwind of the lab to avoid impacting the local forest. On the western face of the building is a 30 m scaffold, walk-up tower with two extended platforms at the top. A sampling manifold made of 2" ID Pyrex glass piping is attached to the tower and draws air from above the top platform of the tower into lab by means of large blower. This allows for a large range of experiments and configurations. Research activities include continuous measurements of O_3, carbon monoxide (CO), peroxyacetyl nitrates (PANs), and meteorological parameters with simultaneous measurements of additional key photochemical species during seasonal intensive field experiments. This combination of measurement and modeling

studies leads to characterization of flow regimes, source regions, and seasonal O_3 formation and loss as a function of air mass history.

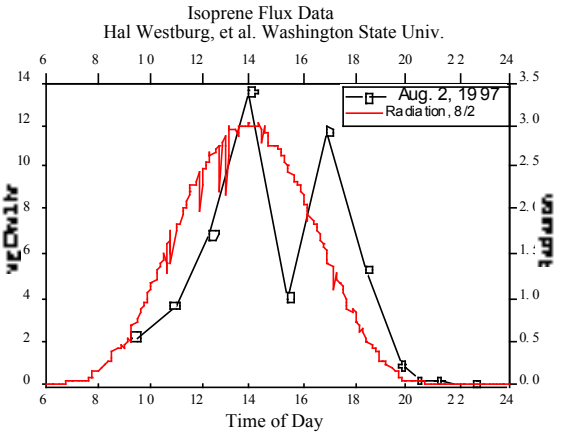
To date there have been five intensive measurement campaigns as part of PROPHET: early and late summer 1997, fall 1997, winter 1998, and summer 1998. The measurements were most comprehensive during the late summer 1997 and the summer 1998 intensives, when simultaneous measurements included NO, NO_2, NO_y, VOCs, organic nitrates, peroxides, and aerosol physical properties and chemical composition. The data obtained during 1997 motivated measurements of several new and key species during the summer 1998 intensive, including the hydroxyl and hydroperoxy radicals (OH and HO_2), formaldehyde (CH_2O), and isoprene nitrates, that will allow us to investigate the photochemistry and relative contributions of biogenic and anthropogenic emissions. Among the broader objectives of PROPHET is the goal of improving our understanding of the role of biogenic hydrocarbons (e.g. isoprene and the terpenes) in controlling the concentration of tropospheric ozone and its precursors. In particular, to date we have been focusing on studying the chemistry of isoprene. Isoprene is emitted globally at a rate of ~400 million metric tonnes/yr.[3], second only to methane among globally emitted reduced forms of carbon. The PROPHET tower is an ideal site to study isoprene chemistry, as the dominant form of vegetation near the Biological Station is aspen, a relatively strong isoprene emitter,[4] and because this site receives highly variable NO_x concentrations in air transported to the site. In the 1997 study, an interesting and perplexing observation was made, specifically that isoprene undergoes rapid decay after sunset. An example case is shown in the figure below, for July 30, 1997.

On this evening, isoprene concentrations



dropped from about 2 ppb at 8pm to <0.1 ppb in a little over 2 hours. This is surprising in that this decay occurs after sunset when free radicals (i.e. OH) that are the dominant daytime sink are believed to have very low concentrations. Given that existing atmospheric models do not come close to accurately simulating this phenomenon, it became clear that our understanding of the atmospheric processing of isoprene is incomplete. At this point, the need for interdisciplinary research and collaboration became apparent, as a hypothesis was raised that a possible explanation for this nighttime decay involved uptake of isoprene in the waxy upper surface of the leaves within the canopy. During the summer 1997 campaign, researchers conducted measurements of isoprene flux into and out of the forest canopy at the PROPHET tower lab. The results of one such set of measurements are shown in the figure below. This figure shows relaxed eddy accumulation data that indicates the magnitude of the flux of isoprene from the forest canopy, obtained by Hal Westberg's group at Washington State University.

This measurement indicates that at sunset the



isoprene flux drops to zero, but most importantly, does not become negative, i.e. isoprene does not undergo uptake into the canopy at night. This argues against surface loss as a mechanism for nighttime isoprene decay.

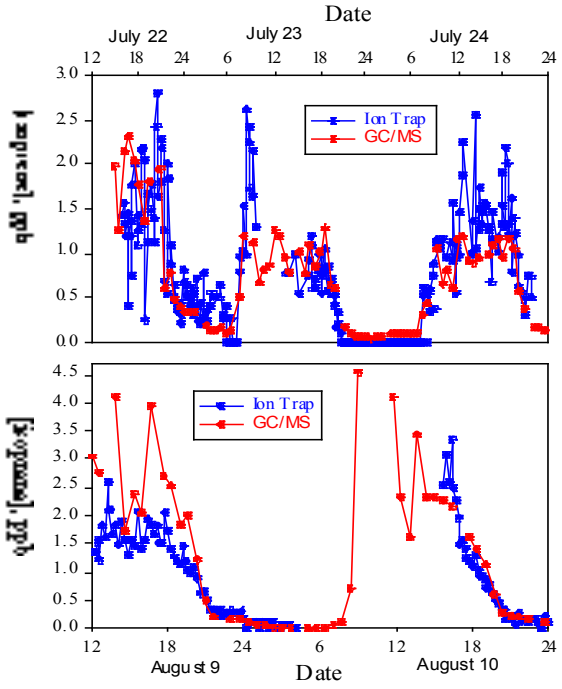
An issue that always arises when ambient measurement data cannot be explained is the reliability of the data. In the summer of 1998 a significantly expanded campaign was conducted at the PROPHET tower lab, including six independent measurements of isoprene. Two of these involved use of mass spectrometry for unambiguous identification of isoprene. Shown in the figure below are isoprene measurement data from

(Continued on page 10)

PROPHET, . . . *Continued*

a GC/MS technique, as well as a chemical ionization MS/MS technique developed by the Shepson group at Purdue. As shown in the figure, there is good agreement between the two techniques, including the data representing the evening isoprene decay.

The last remaining explanations for the isoprene decay involve a) a dynamical explanation involving vertical mixing of the surface air with isoprene depleted air from aloft; and b) a chemical removal process involving reaction with OH radicals, produced by some unknown nighttime source. The former process, espoused by Sandy Sillman at University of Michigan, seems to be able to explain the general features of the timing and nature of the decay, but not the complete extent of the isoprene removal to low ppt concentrations. An intriguing result from the Summer 1997 campaign came from the total peroxy radical data ("RO_x") shown in figure (obtained from the Hastie group at York U., Toronto) that indicated that there was oxidation chemistry occurring after sunset. This raised important questions regarding sources of free radicals at night. Perhaps the most exciting development for the Summer 1998 PROPHET campaign is the addition of OH radical measurements, by the Brune group from Penn State. The new OH measurements in fact indicate a substantial concentration of OH at night, which, along with some help from the vertical mixing mechanism, can explain the observed nighttime isoprene decay rate. The observation of a significant nighttime concentration of OH radicals is a new development, and one that is quite puzzling to us. However, it represents a great opportunity for the PROPHET team to make a valuable new contribution to our understanding of how the atmosphere processes emitted pollutants. In addition, this problem represents a good example of successful multidisciplinary collaborative research through the PROPHET program.



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NARSTO News *contribution by Mary Anne Carroll and the PROPHET science consortium.*

FIELD PROGRAM PLANNING FOR THE CALIFORNIA REGIONAL PM_{10}/ $PM_{2.5}$ AIR QUALITY STUDY

The California Regional PM_{10}/$PM_{2.5}$ Air Quality Study (CRPAQS) is a comprehensive public/private partnership to address PM_{10} and $PM_{2.5}$ in central California. The study is a multi-year program of meteorological and air quality monitoring, emission inventory development, data analysis, and air quality simulation modeling.

The field program plan for the aerometric monitoring programs scheduled for 1999 through 2001 is currently being developed. The objective of the field programs is to obtain a documented data set, with appropriate data qualification statements, that is suitable for characterizing the nature and causes of particulate concentrations and visibility impairment in central California by supporting modeling and data analysis activities. Extensive analysis of historical data and a preliminary field monitoring program known as the 1995 Integrated Monitoring Study provided the basis for the field program design. Input to the design has been solicited from regulatory agencies, data analysts and modelers, and the research/contracting community.

The study monitoring programs are designed to provide a data set to address both the annual and episodic PM standards. The monitoring will consist of 14 months of data collection throughout the San Joaquin Valley (SJV) and surrounding regions, as well as intensive, shorter-term monitoring during fall and winter-like episodic conditions when PM_{10} and $PM_{2.5}$ concentrations are highest.

Air quality sampling locations for the annual monitoring program (December 1, 1999, through January 31, 2001) will build upon, and take advantage of, the extensive existing PM_{10} network, as well as the new $PM_{2.5}$ monitoring networks being established by the Air Resources Board and local air pollution control districts. More than 70 PM_{10} sites and 50 $PM_{2.5}$ sites will be operated as part of this backbone network. Study enhancements to these networks will include full scale "anchor" monitoring sites measuring gaseous and aerosol species, through both filter-based and continuous species specific methods. In addition, "satellite" monitoring sites will measure aerosol species using portable PM monitors and nephelometers. Surface and aloft meteorological measurements will be collected utilizing a network of surface meteorological sites, radar profilers, and sodars.

The fall episodic program will take place over a period of six weeks in October/November of 2000 in the central portion of the San Joaquin Valley. This monitoring window corresponds to periods of historically high PM_{10} concentrations which are dominated by geological material. Specific issues to be addressed in the fall monitoring include identification of the sources of geological material, determination of the zone of influence these sources, and development of improved data on dust suspension and deposition. The fall measurement program will include neighborhood scale saturation monitoring, measurement of organic tracer species and particle morphology, time-of-flight mass spectrometry, and particle suspension and deposition measurements at a 100 meter tower.

The winter episodic field study will take place over a period of eight weeks on a forecast basis during December and January of 2000/2001. $PM_{2.5}$ concentrations have been historically highest during the winter months, with secondary ammonium nitrate and carbonaceous material the dominant constituents. Specific issues to be addressed in the winter monitoring program include identification of the sources of carbonaceous material, determination of the limiting precursors for secondary PM species, surface and aloft transport and mixing mechanisms under low wind speed conditions, and the zone of influence of both primary and secondary sources of PM. The winter measurement program will include an expanded set of anchor sites, an enhanced upper air monitoring network, organic species tracers, fog chemistry, time-of-flight mass spectrometry, and measurement of wet deposition. Special emphasis will be placed on collection of continuous and species specific particulate measurements to support both receptor and grid-based modeling approaches. Methods for collecting information on air quality aloft are also being explored, including the use of the 100 meter tower, an elevated site in the Sierra Nevada mountains, aircraft, and balloon-borne systems.

Field program management, quality assurance, and forecasting teams have been assembled. Contractors and research teams for the monitoring networks will be selected over the next six to nine months. Further details on the field program plan can be found on the study web site located at:

http://sparc2.baaqmd.gov/centralca/

The field program plan is available as a set of Adobe Acrobat files under "Publications". Additional study reports documenting results from the 1995 Integrated Monitoring Study are also available on the web site. Questions on CRPAQS can be directed to Karen Magliano of the California Air Resources Board at (916) 322-7137 or kmaglian@arb.ca.gov.

NARSTO News *contribution by Karen Magliano*

Three New Research Efforts Affiliate with NARSTO

Three additional research efforts have formally affiliated with NARSTO during the past several months. The first of these, the Reactivity Research Working Group (RRWG), is involved with intensive analyses of the relative roles of individual organic compounds in producing ozone. As noted in the article on page 4, the RRWG has been hard at work during the past year, and already has produced some valuable analyses on this subject. The second is a study of ozone production in the Philadelphia and New York corridor area, which is being coordinated by Russ Philbrick at Penn State. As described in the following article, this effort activated a field program during last summer and will conduct a second phase starting this coming May. The Southeastern Aerosol Research and Characterization (SEARCH) program is NARSTO's most recent addition. As noted in the article on page 14, this program is dedicated to the high-quality measurement and characterization of both fine and coarse particulate matter in the Southeastern US region.

NARSTO welcomes these new additions and looks forward to working with them as they move ahead on their important research thrusts.

Investigation of Urban Air Quality in the Northeastern US

A recent addition to the NARSTO program is a unique investigation of the urban air pollution in the Philadelphia area. The corridor along the east coast of the United States from Washington to Boston is known for being one of the regions with frequent occurrences of poor air quality. The program is planned to study pollution events centered around the Philadelphia area. The NARSTO-NE-OPS project, which refers to North East - Oxidant and Particle Study (NE-OPS), is expected to provide important data with insights to understanding regional and urban air pollution events. A factor that makes this investigation unique is emphasis on the vertical mixing and horizontal transport of chemical species and particulate matter. For the first time, the project brings together remote sensing lidar, tether sondes, radio-acoustic sounders, balloon sensors and aircraft. These techniques provide a three dimensional picture of the important parameters needed to investigate air pollution events.

The core of the NE-OPS project is a research center grant sponsored by the USEPA under the National Center for Environmental Research and Quality Assurance (NCERQA) program. Grant number R82-6373-010 was awarded in April 1998 to Penn State University for "Investigations of Factors Determining the Occurrence of Ozone and Fine Particles in Northeastern USA." Additional information about the project is available on the web site: http//es.epa.gov/ncerqa_abstracts/grants/97/ozone/. The Co-Investigators for the project include researchers from Harvard University, Millersville University, University of Maryland, SUNY-Albany, Rutgers University, and Brookhaven National Laboratory. The project also includes researchers from the City of Philadelphia (Air Services Management Offices), Pennsylvania Department of Environmental Protection, Pacific Northwest National Laboratory, Argonne National Laboratory and several other universities (see Table 1). The EPA Project Officer is Dr. Deran Pashyan. An advisory committee has been formed for the program to help provide some oversight and suggest ways that the participants can maximize the usefulness of the project results.

The research program includes the most advanced instrumentation for investigations of the gaseous and particulate components in the atmosphere. The physical properties of the atmosphere are described based on remote sensing profiles, balloon instrumentation and aircraft instruments. A major goal of these air pollution studies is to understand the emission sources and atmospheric processes which cause elevated air pollutant concentrations by considering both local and regional scales. Many pollutants exhibit similar spatial and temporal concentration patterns, due to photochemical, meteorological, and other factors, including the fact that they have similar precursors which have similar emission sources. The links between ozone and fine particle mass are especially striking, but there are several significant gaps in understanding which can limit effective decision making and control strategies.

The goals of these investigations include finding the relationships and conditions leading to high ozone concentrations and increased levels of fine particles, determining the contributions from local and distant sources, examining the roles that meteorological properties play in concentrating and distributing pollutant concentrations and interpreting these results within the context of past measurement programs to extend our knowledge of air pollution events.

Table 1. List of the investigators in the NARSTO-NE-OPS Project.

Penn State University - C.R. Philbrick (PI), D. B. Lysak: Advanced lidar remote sensing, optical scattering, atmospheric structure and dynamics

Millersville University - R. D. Clark: Boundary layer meteorology, tethersonde measurements

Harvard University

School of Public Health - P. Koutrakis, G. Allen, J. Lawrence, J. M. Wolfson, V. Hatch: Atmospheric gas and aerosol chemistry

Engineering and Applied Science - S. C. Wofsy, J. W. Munger: NO_y measurements and regional reference site at Harvard Forest

University of Maryland - R. Dickerson, B. Doddridge: Instrumentation and use of small aircraft , Shenandoah National Forest regional site

Philadelphia Air Services Management Laboratory - W. C. Miller: Philadelphia PAMS and data from several sites, PM monitor at prime site

State University of New York - S. T. Rao, V. Mohnen, I. Zurbenko, S. Porter: Analysis and model calculations of air masses, Whiteface Mountain regional site

Rutgers University Env. and Occupational Health - P. Georgopoulos and M. Lazaridis: Emission inventories and chemistry modeling, experience with Philadelphia area

Brookhaven National Laboratory - L. Newman, P. Daum: Instrumented aircraft (G-1) with measurements of chemistry and aerosol properties

The Philadelphia Baxter Water Treatment Plant was selected to be the primary site because of its location just to the northeast of city center on the shore of the Delaware River. The site location provides power, communications, security, and a fairly clear area. One advantage of the location is that it is about 3 miles from the Northeast Philadelphia Airport, within their controlled air space, which provides an additional safety net for the tethersonde and lidar operations. The tethersonde is operated between the surface and 300 meters, so it is below the FAA minimum flight height (about 1200 feet) defined as 1000 feet above the highest structure, and notice is given to pilots on approaching the 5 mile control zone about the airfield.

During July and August 1998, the site at the Baxter Water Treatment Plant was prepared and set up with two lidar sounders from Penn State University, several chemistry and particulate measuring instruments from Harvard University, two tethersonde balloons (38 ft and 18 ft) from Millersville University, and measurements from the City of Philadelphia, Air Services Management Laboratory. The University of Maryland also provided an instrumented Cessna 172 aircraft operating out of the nearby Northeast Philadelphia Airport. Instruments were tested and calibrated and a two week pilot study was conducted August 10 - 22. The measurement period included several interesting atmospheric conditions, provided data for comparison of several techniques, and demonstrated capabilities for the coming intensive studies. The operation of the lidar, tethersonde balloon and aircraft together provided a useful demonstration of measuring capabilities. The Penn State University lidar uses Raman optical scattering techniques to obtain profiles from the surface to altitudes above 3 km of the water vapor, temperature, ozone and optical extinction. The Millersville University tethersondes provide profiles of the ozone and particle measurements in addition to the standard meteorological data between the surface and 300 meters.

The first full scale intensive period will start 15 June 1999 with a period of setup and calibration. Intensive measurements will be conducted between 27 June and 20 August 1999. Several additional instruments and research groups will be joining in the measurement activities during 1999. Additional ground based sites will be set up at upwind and downwind locations. Radio-acoustic sounders will be located at the Philadelphia site and other regional sites to provide measurements of the lower atmosphere wind field and temperature profiles. Balloon sondes for upper level profiles will be released to supplement the twice daily soundings by the US Weather Service during interesting atmospheric conditions. The DOE G-1 aircraft, which is instrumented for particles and chemistry measurements, will participate in the last half of the measurement program between 19 July and 20 August. During the period, city and state monitoring instruments will provide local and regional measurements of chemical species and particulate matter.

The project will also include a winter intensive measuring period in January 2000 and a second summer intensive June-August 2000. The winter intensive is to help establish the conditions that lead to particle pollution events in the winter season when the photochemical processes are absent.

Narsto News *contribution by Russ Philbrick*

SEARCH and ARIES Foster NARSTO Thrust into PM Research

Two major initiatives expanding the Southern Oxidants Study (SOS) and NARSTO into the field of particulate matter (PM) studies began during mid-1998 in the Southeast.

The Southeastern Aerosol Research and Characterization Study (SEARCH) augments and expands the old Southeastern Consortium: Intermediate Oxidant Network (SCION) from three to eight stations, now measuring a suite of PM-related properties as well as trace gases and meteorological variables. One SEARCH station, in Atlanta, is even more comprehensively instrumented and serves as a host site for experimental, complementary, and comparative measurements by collaborating groups, such as the EPA ($PM_{2.5}$) Supersite Program, the Southern Center for the Integrated Study of Secondary Air Pollutants (SCISSAP), and the Assessment of Spatial Aerosol Composition in Atlanta (ASACA). Its main mission, however, is to support the Aerosol Research Inhalation Epidemiological Study (ARIES) with ambient measurements.

SEARCH's objectives at four urban-rural site pairs in GA, AL, MS and FL are to 1) measure and compare urban and regional PM atmospheric loadings, 2) characterize chemical relations between precursor compounds and their oxidant and PM products, 3) characterize to the degree practical the chemical composition and morphology of fine PM, 4) develop and test methods for the reliable continuous measurement of atmospheric constituents, 5) develop and test methods that minimize sampling biases, 6) quantify biases in measurement systems, including the Federal Reference Method (FRM) for $PM_{2.5}$, 7) attribute PM components and ozone to their sources, and 8) provide support to Federal, State, and local programs.

Instrumentation in use or planned at SEARCH sites includes sensors for wind speed, wind direction, temperature, dew point, barometric pressure, solar radiation, and precipitation amount and continuous analyzers for O_3, NO, NO_2, NO_y, HNO_3, NH_3, CO, $PM_{2.5}$, mass, sulfate, nitrate, ammonium, and elemental and organic carbon. A variety of discrete samplers, including an FRM, variously allow the determination of PM_{10}, coarse and fine particles mass, fine particle ions, trace metals and organic compounds having various solubility properties. Particle scattering and absorption are measured continuously at one Alabama site.

SEARCH is scheduled to complete field operations in August 2001.

Whereas SEARCH clearly falls under the aegis of NARSTO, ARIES demonstrates how the atmospheric science mission of NARSTO can be smoothly interfaced with health effects research. Because of the emphasis on collecting data suitable for epidemiological analyses, measurements at the Atlanta SEARCH/ARIES site have been augmented with additional measurements of PM components with putative or known health impacts. These include fine particle acidity, fine and ultrafine particle number size distributions, speciated VOC, and suspended biological materials such as pollen and mold.

NARSTO News *contribution by Alan Hansen*

SOS Plans its "Tale of Two Cities" Campaign

This summer the Southern Oxidants Study (SOS) program plans a two-city campaign, which will focus on Nashville, Atlanta, and their surrounding regional areas. The Nashville component will take place during June and July, while the Atlanta effort — which will be confined largely to surface-based observations — will occur during August. These two studies are linked strongly with a number of individual measurement efforts and health-effect investigations.

Extensive descriptive material and planning documentation are available on the NOAA Aeronomy Laboratory SOS Web site (http://www.al.noaa.gov/WWWHD/Pubdocs/SOS/SOS99.html). Newsletter Number 1, assembled by Jim Meagher and available at this site, provides a particularly lucid description of this complex operation, and is recommended reading for all interested persons.

"Texas 2000" Field Study of Ozone, PM 2.5, and Regional Haze

On March 8 and 9 the Texas Natural Resources Conservation Commission (TNRCC) held its second set of open meetings to design a major air-pollution measurement and evaluation campaign. Scheduled for the summer of 2000, this campaign will be a joint effort of a number of participating organizations. It will be centered in

the Houston area, but will include a major portion of the East Texas region within its domain.

Houston has the second worst ozone pollution problem in the US, and the type of flow reversal episodes over the Houston Ship Channel that typically produce the highest local ozone levels cannot yet be modeled adequately. There are several possible reasons for this unsatisfactory model performance:

1) the complexity of the meteorology, with sea and bay breezes, which is not handled adequately with the meteorological models used for past analyses of the area;

2) inconsistencies in the emission inventories, which currently show discrepancies of a factor of two or larger between inventory VOC/NO_x ratios, compared to those in ambient air;

3) the contribution of chlorine emissions to photochemistry, which is not included in reaction schemes of models applied to the area to date;

4) the possible inadequacy of current chemical schemes for handling the rapid addition of fresh VOC and NO_x emissions to an aged photochemical mix as it flows back over the Ship Channel;

5) the possibility that large, unscheduled, and undocumented VOC releases may be involved in some unusually high ozone events near the Ship Channel, and

6) uncertainties in the inventory of biogenic VOC emissions, which may be overestimated by a factor of three in the Houston urban area.

On a larger geographic scale, it is important to note that a number of significant pollution sources are distributed throughout East Texas which, along with Houston, contribute to the regional pollution burden. Consequently the Texas 2000 study's design will incorporate this larger area within its spatial domain. Owing to its meteorological and chemical complexity, this study involves substantial technical demands, and currently the Texas 2000 Science Team is working hard on the science plan to pool available resources to maximum advantage to meet this challenge. Their draft science plan will be posted on the NARSTO Web site some time this April for external review and comment.

MIRAGE: NCAR Views Possibility of Future Mexico City Study

Launched recently as a major new atmospheric-chemistry initiative, the NCAR Megacity Impact on Regional and Global Environment (MIRAGE) program is a research effort to determine how "megacities" affect the environment on local, regional and global scales. Its basic long-term objectives are to:

- study the physical processes that produce and disperse urban pollutants,
- evaluate how urban aerosols and gases interact with one another and alter their environment, and
- develop modeling tools that will assist researchers in diagnosing and predicting these mechanisms of pollutant production and subsequent environmental interactions.

One potential MIRAGE component currently under consideration is a proposed set of Mexico City campaigns, to be performed as a joint effort with Mexican institutions and scientists. Scheduled for July and November/December 2000, these campaigns are designed to address the following megacity-related issues:

1) Solar and terrestrial radiative fluxes, particularly at wavelengths that are photochemically important.

2) Hydrological processes, e.g., how urban effluents alter cloud properties, how clouds clean these effluents from the atmosphere, and subsequent effects on soil chemistry and vegetation due to precipitation that contains these urban bi-products.

3) Photochemical processes, e.g., critical time and length scales and their dependence on local meteorology and aerosols.

4) Local micrometeorology, e.g., aerosol-radiative effects on evolution of the boundary layer, its thermodynamic stability and local air motions.

5) Aerosol formation and evolution, e.g., new particle formation, coagulation and sedimentation.

Further information on MIRAGE and its Mexico City component appears on the MIRAGE Web site: http://raf.atd.ucar.edu/~darrel/mirage.html.

One Step Forward and . . . : Some Cautionary Notes on Urban Ozone Measurements

For those of us who thought we had urban ozone measurements operating on a foolproof and routine basis, the Critical Review Paper by Dave Parrish and Fred Fehsenfeld offers some sobering thoughts. Quoting them:

"Laboratory studies have shown significant interferences in the UV absorption technique from aromatic hydrocarbons and their oxidation products [Kleindienst et al., 1993, 1997]. Nevertheless, this technique is commonly employed for routine monitoring in the areas where such interferences would be most likely to occur. From an analysis of possible errors in the UV absorption measurements of O_3, it has been plausibly argued that approximately half of the areas designated in 1993 as non attainment, may actually have been in compliance with the O_3 standard [Leston and Ollison, 1992]. The errors found likely to occur in these monitors involved calibration uncertainties and anomalous operating conditions as well as ambient interferants. The errors were found to be especially large during the hot, humid and stagnant conditions that are typical of O_3 standard violations. Such uncertainty in measured O_3 levels is not tolerable."

They state further that:

"UV absorption is a particularly efficient technique for ambient monitoring of O_3, primarily because it does not require any reagent gases or liquids, which are required by techniques such as the chemiluminescence methods. The UV absorption technique has a further advantage in that it is, in principle, an absolute measurement; the measured absorbance is directly related to the O_3 concentration only through the optical path length and the absorption cross section of O_3. Conversion of the measured O_3 concentration to mixing ratio units requires only the accurate measurement of temperature and pressure in the absorption cell. Given the absolute character of the measurement, it is curious that the "calibration" procedures for the federal equivalent method UV absorption ambient O_3 monitors recommends adjusting the "span" control of the monitor until the instrument reading agrees with the output of a standard ozone generator. This approach is inadequate; it can at worst perpetuate serious measurement problems since the ozone standard itself is merely a similar UV absorption measurement system coupled to an ozone generator. A much more critical assessment of a field O_3 monitor would be always to maintain the span control at its standard setting, and frequently to compare that instrument with another O_3 monitor that is carefully maintained in good operating order. These comparisons should include both instruments measuring ozone in ambient air. If the field instrument is found to disagree with the reference instrument, it should be repaired or cleaned to correct the problem."

Finally they conclude that:

" . . . the monitoring of O_3 in non-attainment areas has critical uncertainties with large economic and societal implications. Field intercomparisons during the conditions of O_3 exceedences are critically needed to reduce these uncertainties. At the same time so-called "calibration" procedures should be reviewed, at least for the UV absorption technique."

The complete text of the Parrish - Fehsenfeld paper, as well as those of other Critical Review Papers, are posted on the NARSTO Web site.

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Pauline Midgely Assumes EUROTRAC Coordinator's Role

Pauline Midgely has been selected to replace Peter Borrell, who retired recently as EUROTRAC Executive Secretary. As such, Pauline will be responsible for overall coordination of EUROTRAC-2, and for admistrating the International Scientific Secretariat, which is located at the GSF Forshungszentrum für Umwelt und Gesundheit in Munich.

Pauline did her PhD work at the University of Birmingham on photochemical reaction-kinetic processes associated with tropospheric pollution formation, and proceeded on to a post doctoral assignment at Queen Mary College, London, where she conducted research on halocarbon decomposition reactions. Following her university work, Pauline spent 12 years in industry, with ICI, continuing her research on halocarbon reaction behavior. During this time, as well as during her more recent activities as an independent consultant, she has worked extensively on international teaming efforts to develop halocarbon emission inventories, and to coordinate joint publications pertaining to halocarbons and their effects on ozone and the climate. Pauline is a contributing author to the most recent WMO-UNEP Scientific Assessment of the Ozone Layer, and to the Third Climate Assessment Report of the IPCC.

PM Research Measurement Subcommittee Being Formed

Following a directive from the NARSTO Executive Assembly at its January 1999 meeting, a move has been made to form a " Subcommittee on PM Research Measurements," which will help establish the scientific underpinnings for research-network particulate-matter measurements, promote cooperative interchanges between the health- and physical-science communities, and encourage the pooling of intellectual, material, and financial resources.

Reflecting the desire for health-effect and atmospheric communications, Dan Greenbaum of the Health Effects Institute and Dan Albritton of the NOAA Aeronomy Laboratory have agreed to serve as Subcommittee Co-Chairs. Currently they are developing a charter for the group, and anticipate approaching several key scientists to serve as Committee members shortly. The charter will be posted on the NARSTO Web site when it becomes available.

First North American Tropospheric Aerosol Symposium to be Held in Mexico

The first North American Tropospheric Aerosol Symposium is planned for the fall of the year 2000 to be held near Mexico City, Mexico. The meeting is being organized to bring together the latest findings from research on fine particulate matter in the atmosphere and provide a forum for the presentation of the results from recent binational and trilateral field programs in Mexico, Canada, and the US. Because submicron-size particles are transported over long distances, the issue is one of continental scale and importance and is of great interest to NARSTO organizations. Representatives from all three countries will co-chair the workshop. Co-chairs are: Jake Hales, NARSTO Management Coordinator, Don McKay, Public Sector NARSTO Chair, and Adrian Fernandez of the Instituto Nacional de Ecología.

This symposium will include sessions on scientific issues associated with tropospheric aerosols, including emission and formation, human health impacts, measurements and modeling, transboundary exchange, results from field studies, and science-policy linkages.

A call for papers to be presented at the meeting will be issued this summer.

NARSTO Management Coordinator's Office
60 Eagle Reach
Pasco, WA 99301