

PHOENIX 2001 AIR QUALITY STUDY DATA WORKSHOP

On April 2-3 Carl Berkowitz, Chris Doran, Jerome Fast, and Chet Spicer participated in a data workshop held in Phoenix, Arizona, to discuss results from the Phoenix 2001 Air Quality Study (also referred to as the "Phoenix Sunrise Campaign") with Carl serving as moderator for the workshop. This study looked at air quality and boundary layer processes at sunrise over an urban site. Chet presented preliminary results from measurements made at two elevations from the Bank One Building in downtown Phoenix last June. Collaborators with PNNL in this study include Argonne National Laboratory, the Arizona Department of Environmental Quality (ADEQ), Arizona State University, Battelle Columbus, Brookhaven National Laboratory, Lawrence Livermore National Laboratory, Loyola University at Chicago, the University of Alaska at Fairbanks, and the University of California at Los Angeles. Details (for the popular press) of the project are summarized at http://www.sc.doe.gov/feature_articles_2002/March/Phoenix_Air/PNNL-Phoenix-Air-Quality.htm.

NCAR CCSM ATMOSPHERIC MODEL WORKING GROUP MEETING

Steve Ghan and Tom Ackerman attended a National Center for Atmospheric Research (NCAR) Community Climate System Model (CCSM) Atmospheric Model Working Group meeting April 3-4 in Boulder, Colorado.

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Check out the latest edition of the Quarterly Newsletter of the ETV Advanced Monitoring Systems (AMS) Pilot, *The Monitor*, for additional information about EPA's Environmental Technology Verification Program and all 12 of its pilots on the World Wide Web at <http://www.epa.gov/etv> or you can go directly to the AMS pilot's information at http://www.epa.gov/etv/07/07_main.htm.

UNIVERSITY OF WASHINGTON SEMINAR

Dave Whiteman presented a seminar at the University of Washington on April 5. He also discussed topics in complex terrain meteorology with Dr. Ted Harrison and Dr. Cliff Mass.

ARM SCIENCE TEAM MEETING

Evgueni Kassianov of the Climate Dynamics Group attended the Annual Atmospheric Radiation Measurement (ARM) Science Team Meeting in St. Petersburg, Florida, from April 8-11. He gave four poster presentations (see Presentations/Publications).

VISIT TO PNNL - DR. ASTLING

Dr. Al Astling from Dugway Proving Ground in Tooele, Utah, visited PNNL on April 11 and discussed analyses of data from the Vertical Transport and Mixing Experiment (VTMX) with PNNL scientists who are participating in VTMX.

FITZNER-EBERHARD DIRECTOR'S AWARD

On April 18 Dave Whiteman received the Fitzner-Eberhard Director's Award for Outstanding Contributions to Science and Engineering Education. The award is one of three awards that are presented annually at PNNL to recognize staff members' contributions to education. Dave's contributions include mentoring of students and staff, university instruction, and international education. In 2001 he mentored two summer students who came to

News from Atmospheric Sciences is published quarterly for parties interested in the work of atmospheric scientists at Pacific Northwest National Laboratory, which is operated for the U.S. Department of Energy by Battelle Memorial Institute. For more information contact:

W. Richard Barchet – Atmospheric Sciences – (509) 372-6158 – Fax: (509) 372-6168 – e-mail: rich.barchet@pnl.gov

Ted S. Cress – ARM Infrastructure/Climate Dynamics – (509) 375-6964 – Fax: (509) 372-6247 – e-mail: ted.cress@pnl.gov

James G. Droppo – Multimedia Exposure Assessment - (509) 376-7652 – Fax: (509) 373-0335 – e-mail: james.droppo@pnl.gov

Pacific Northwest National Laboratory - P.O. Box 999, K9-24, Richland, WA 99352.

the lab under DOE's Global Change Educational Program and one student from New Zealand.

VISIT TO PNNL - VAISALA, INC.

Mr. Matt Jones from Vaisala, Inc. of Boulder, Colorado, visited PNNL on May 1 and gave a presentation on Vaisala's upper air sounding equipment and their plans for the development of new equipment.

MISSISSIPPI RIVER CLIMATE AND HYDROLOGY CONFERENCE

Ruby Leung attended the Mississippi River Climate and Hydrology Conference on May 13-17 in New Orleans, Louisiana. She gave two oral presentations at the sessions on Predictability and Prediction System and Water Resource Applications (see Presentations/Publications).

VISIT TO UNIVERSITY OF FREIBURG

Dave Whiteman presented a seminar at the University of Freiburg, Germany, on May 15 and taught a short course on mountain meteorology there from May 27 through May 31 during his vacation travel to Europe. He visited the University of Munich on June 5, where he presented a seminar and discussed cold pool research, atmospheric modeling in complex terrain, and foehn wind simulations with Professor Joseph Egger, Dr. Guenther Zaengl and Mr. Matthias Hornsteiner. Dave visited the University of Vienna and Austria's Central Institute for Meteorology and Geodynamics (ZAMG) on June 6 and 7 to discuss the initial results from a meteorological field experiment conducted during a clear weather period on June 24 to study the development of cold air pools in a small basin southwest of Vienna. Equipment from PNNL was used in this experiment, conducted collaboratively with the University of Vienna (Drs. Steinacker, Dorninger and Hantel), the Austrian Agricultural University (Dr. Mursch-Radlgruber), and ZAMG (Ms. Baumann). Dave made arrangements for the shipment of loaned equipment back to PNNL and made initial plans for two students at the University of Vienna to come to PNNL in the fall for 4 to 6 months to help with the analysis of data from the experiments. On June 7, he also discussed ongoing research on the momentum balance of slope flows with Dr. Thomas Haiden at ZAMG. Dr. Haiden is collaborating with Dave and Shiyuan Zhong on research on this topic as part of DOE's Vertical Transport and Mixing Experiment using data from Salt Lake City, Utah.

GEWEX GCSS ARM WORKSHOP

Steve Ghan and Tom Ackerman attended the Global Energy and Water Experiment (GEWEX) Cloud System

Study (GCSS) - Atmospheric Radiation Measurement (ARM) Workshop on the Representation of Cloud Systems in Large-Scale Models, held May 20-24 in Kananaskis, Alberta, Canada. Steve presented a paper "Impact of Aerosol Size Representation on Modeling Aerosol-Cloud Interactions" coauthored by Yang Zhang of Atmospheric & Environmental Research, Dick Easter of PNNL, and Hayder Abdul-Razzak of Texas A&M Kingsville.

VISIT TO PNNL - GAVIN MCMEEKING

Gavin McMeeking, a Summer Undergraduate Research Experience student who recently graduated from the University of California at Berkeley, arrived at PNNL on June 3 to work with Dave Whiteman as part of DOE's Global Change Education Program. Gavin is performing analyses of temperature inversions and downslope flow using a data set collected by students last summer over a plateau area southwest of Richland. Gavin will be attending graduate school in the Atmospheric Science Department at Colorado State University with advisor Dr. Sonya Kreidenweis. His interests are in atmospheric chemistry and mountain meteorology and he will be spending 1 to 2 weeks collecting air sampling data for Dr. Kreidenweis in Yosemite National Park in August.

CANADIAN SOCIETY OF CHEMISTRY ANNUAL MEETING

On June 3 Tom Jobson gave an invited talk on the Pacific Northwest 2001 Air Quality Study in Puget Sound at a special session of the Canadian Society of Chemistry Annual Meeting in Vancouver, British Columbia, Canada, devoted to describing results from recent air quality studies in Vancouver.

11TH CONFERENCE ON ATMOSPHERIC RADIATION

Mikhail Ovtchinnikov of the Climate Dynamics Group attended the 11th Conference on Atmospheric Radiation from June 3-7 in Ogden, Utah, where he presented a paper and he also coauthored a paper presented at the parallel 11th Conference on Cloud Physics (see Presentations/Publications).

VISIT TO PNNL - DR. TOM HENDERSON

Tom Henderson from the NOAA Forecast Systems Laboratory in Boulder, Colorado, visited PNNL from June 12-14 to work with Mikhail Ovtchinnikov on parallelization of a cloud model. Mr. Henderson currently leads the team that developed the Scalable Modeling System (SMS), a software tool that makes parallel computing easier for non-experts. The SMS team supports scientists at several NOAA laboratories and has

successfully delivered parallel codes to outside customers such as NASA's Goddard Space Flight Center, Los Alamos National Laboratory, and the Taiwanese Central Weather Bureau. While at PNNL Mr. Henderson presented a seminar entitled "SMS: A High-Level Directive-Based Alternative to MPI." The visit was sponsored by the Computational Sciences & Engineering Initiatives.

VISIT TO PNNL - DR. FRED BRECHTEL

Dr. Fred Brechtel (formerly of Brookhaven National Laboratory, now with Brechtel Manufacturing, Inc.) visited PNNL from June 14-18 to install, test, and characterize a new aerosol inlet for PNNL's Gulfstream 159 (G-1) aircraft as part of an DOE/SBIR project with Aerodyne Research, Inc. (Doug Worsnop and John Jayne, PIs). This double diffuser cone inlet uses active computerized flow control to maintain isokinetic flow at the inlet over an altitude range from sea level to about 8,000 ft MSL at a ~100 m/s sampling speed. Pick-offs along the 1.5" OD stainless steel manifold provide sample air to other devices: Aerodyne's new Aerosol Mass Spectrometer (AMS), BNL's Particle-In-Liquid-System (PILS), and Brechtel's Tandem Scanning Electrical Mobility Sizer (TSEMS) along with PNNL's Time-Resolved Aerosol Sampler, 3-wavelength nephelometer, condensation particle counters, and aerosol light absorption sensor. The new aerosol inlet and AMS are undergoing further testing before being part of a more extensive series of flights in this summer's Atmospheric Chemistry Program field campaigns (BNL's Northeast Aerosol and Oxidant Study [NAOS] and PNNL's Nighttime Aerosol and Oxidant Experiment [NAOPEX]) based in Worcester, Massachusetts.

AMS 10TH CONFERENCE ON MOUNTAIN METEOROLOGY

Many of the members of the boundary layer group presented papers at the American Meteorological Society's 10th Conference on Mountain Meteorology and Mesoscale Alpine Programme (MAP) at Park City, Utah, during the period June 17-21. Attendees included Jim Barnard, Chris Doran, Jerome Fast, Will Shaw, Dave Whiteman, and Shiyuan Zhong. Chris presented an invited paper that gave an overview of DOE's Vertical Transport and Mixing (VTMX) program. The boundary layer groups' papers (see Presentations/Publications) were part of the 29 papers submitted by VTMX participants at this conference.

TESTING OF GSSL EQUIPMENT

Bob Moody and Tim Lachenmeier of GSSL worked with Rahul Zaveri and Carl Berkowitz and the G-1 team to install and test equipment for tracking GSSL constant

altitude tetroons and ENSCI GPS/radiosonde/ozonosonde instrument packages. On June 18, after a successful launch under very adverse high wind conditions from the Pasco airport, the tetroon was tracked by the G-1 and, more importantly, by FAA ATC surface radar beyond the 30 nautical mile range that defines Class B airspace around major airports. The flight also afforded a test of software developed by Zaveri for tracking the tetroon, forecasting its position, and setting up flight patterns to enable Lagrangian sampling. The instrument package was recovered by a ground team some 42 nautical miles from its launch point. Tetroons will be an important component of the NAOPEX field study later this summer.

PREPARING FOR NAOS AND NAOPEX FIELD STUDIES

Vic Morris traveled to Worcester, Massachusetts, on June 23 to prepare facilities at the Worcester Regional Airport for this summer's Atmospheric Chemistry Program field studies. The G-1 with pilots Bob Hannigan and Dick Hone arrived on June 25; they met with FAA officials on June 28 to coordinate this summer's field studies with FAA ATC. Installation of the Aerodyne Aerosol Mass Spectrometer by John Jayne and Alex Laskin (PNNL) was successfully accomplished on June 26. Yin-Nan Lee and Xiao-Ying Yu (BNL) arrived in Worcester June 28 to install the BNL PILS. Fred Brechtel arrived June 30 to complete the installation of the aerosol inlet and prepare the TSEMS for testing of the AMS. Airborne testing of the inlet, AMS and other aerosol measuring systems will take place in early July. After additional BNL instrumentation is installed, the NAOS field study will be from July 10 through July 23 and the NAOPEX field study from July 27 through August 10.

VTMX WORKING GROUP ON SLOPE FLOWS, COLD POOLS AND CANYON FLOWS

Dave Whiteman convened an evening meeting of the VTMX Working Group on Slope Flows, Cold Pools and Canyon Flows on June 24 at the 10th Conference on Mountain Meteorology and MAP. About 15 VTMX investigators attended. The attendees summarized their findings, progress, and future plans for analyses of VTMX 2000 data.

TOULOUSE, FRANCE

Steve Ghan traveled to Toulouse, France, to present two papers at a Round Table on Aerosol-Cloud-Radiation Interactions in Boundary Layer Clouds, held June 24-27 at the Meteo-France Conference Center. He also traveled to Oslo, Norway, to meet with Trond Iverson, Jan Egill Kristjansson, and Alf Kirkevag of the University of Oslo on July 1 and 2 to discuss codevelopment of a global

aerosol model. At the University of Oslo Steve presented two seminars.

VTMX MINI-WORKSHOP ON SLOPE FLOWS

Dave Whiteman and Shiyuan Zhong held a VTMX mini-workshop on slope flows at PNNL during the week of June 24-28. The workshop was convened to facilitate collaborative research with two visitors, Dr. Thomas Haiden from the Central Institute for Meteorology and Geodynamics in Vienna, Austria, and Dr. Meinolf Kossmann from the German Weather Service at Offenbach, Germany. Both scientists visited PNNL following the Park City Conference. Dr. Kossmann was at PNNL from June 24-28, and Dr. Haiden worked at PNNL from June 24 through July 3. Summer students participated in the technical discussions during the week. On Thursday, June 27, other boundary layer group members were invited to attend presentations by the conferees and students. Dr. Eric Skillingstad from the University of Oregon attended this session and summarized his experiences with Large-Eddy Simulation modeling of VTMX slope flows observations. Dr. Kossmann presented a department seminar on an atmospheric heat budget investigation of New Zealand's MacKenzie Basin.

VISIT TO PNNL – CRAIG CLEMENTS

Craig Clements, a graduate student at the University of British Columbia (UBC), returned to PNNL for a summer assignment as part of DOE's Global Change Education Program on June 27. He will be working with Dave Whiteman and Gavin McMeeking on two projects. He will be finishing a research paper on cold pool development in Utah's Peter Sinks basin and will be analyzing data from last summer's investigation of cold pools in a plateau area southwest of Richland. Craig's advisor at UBC is Dr. Ian McKendry.

Presentations/Publications

Abdul-Razzak, H., and S. J. Ghan

"A Parameterization of Aerosol Activation. 3. Sectional Representation." *J. Geophys. Res.* 107(D3):AAC 1-1 through AAC 1-6 (DOI 10.1029/2001JD000483).

Chapman, E. G., W. J. Shaw, R. C. Easter, X. Bian, and S. J. Ghan

"The Influence of Wind Speed Averaging on Estimates of Dimethylsulfide Emission Fluxes." *J. Geophys. Res.* (in press).

Disselkamp, R. S., J. F. Kelly, R. L. Sams, and G. A. Anderson

"Signal-to-Noise Enhancement Techniques for Quantum Cascade Absorption Spectrometers Employing Optimal Filtering and Other Approaches." *Appl. Phys. B* (in press).

Ghan, S. J.

"Application of a Subgrid Orography Scheme to a Global Climate Model." Presented at the University of Oslo, July 2, 2002, Oslo, Norway.

Ghan, S. J.

"Cloud-Aerosol Interactions in Global Aerosol Models." Presented at the University of Oslo, July 1, 2002, Oslo, Norway.

Ghan, S. J., and H. Abdul-Razzak

"Parameterizations of Aerosol Activation in GCMs." Presented at a Round Table on the Aerosol-Cloud-Radiation Interaction in Boundary Layer Clouds, June 24-27, 2002, Meteo-France Conference Center, Toulouse, France.

Ghan, S., X. Bian, A. Hunt, and A. Coleman

"The Thermodynamic Influence of Subgrid Orography in a Global Climate Model." *Climate Dynamics* (in press).

Ghan, S. J., R. C. Easter, and Y. Zhang

"Aerosol Processing in Clouds." Presented at a Round Table on the Aerosol-Cloud-Radiation Interaction in Boundary Layer Clouds, June 24-27, 2002, Meteo-France Conference Center, Toulouse, France.

Jobson, B. T., W. R. Barchet, and L. A. Barrie

"Highlights of the Pacific Northwest 2001 Air Quality Study in Puget Sound." Presented at a special session of the Canadian Society of Chemistry Annual Meeting, June 3, 2002, Vancouver, British Columbia, Canada.

Kossmann, M.

"Thermally Driven Circulations in New Zealand's McKenzie Basin." Presented at the Atmospheric Sciences Department Seminar, June 27, 2002, Pacific Northwest National Laboratory, Richland, Washington.

Leung, L. R., Y. Qian, X. Bian, and A. G. Hunt

"Effects of Orography on Mesoscale ENSO Precipitation Anomalies in the Western U.S." Presented at the Twelfth PSU/NCAR Mesoscale Model Users' Workshop, June 24-25, Boulder, Colorado.

Leung, L. R., Y. Qian, X. Bian, and A. G. Hunt

"Effects of Orography on Mesoscale ENSO Precipitation Anomalies in the Western U.S." Presented at the Mississippi River Climate and Hydrology Conference, May 13-17, New Orleans, Louisiana.

Leung, L. R., M. S. Wigmosta, and L. W. Vail

"Use of Seasonal Climate Forecasts for Water Resources Management in the Tennessee River." Presented at the Mississippi River Climate and Hydrology Conference, May 13-17, New Orleans, Louisiana.

McMeeking, G. R., C. D. Whiteman, S. Powell, and C. B. Clements

"Evolution of the Nocturnal Atmospheric Boundary Layer Over a Columbia Basin Vineyard." Presented at the 25th Conference on Agricultural and Forest Meteorology, May 20-24, 2002, Norfolk, Virginia.

Mikheev, V. B., P. M. Irving, N. S. Laulainen, S. E. Barlow, and V. V. Pervukhin

"Laboratory Measurement of Water Nucleation Using a Laminar Flow Tube Reactor." *J. Chem. Phys.*, 116(24):10,772-10,786.

Shutthanandan, V., S. Thevuthasan, R. S. Disselkamp, A. Stroud, A. Cavanaugh, E. M. Adams, D. R. Baer, L. A. Barrie, S. S. Cliff, and T. A. Cahill

"Development of PIXE, PESA, and Transmission Ion Microscopy Capability to Measure Aerosols by Size and Time." *Nucl. Instr. & Methods in Phys. Res. B: Beam Interactions with Materials and Atoms* 189:284-288.

Spicer, C. W., R. A. Plastridge, K. L. Foster, B. J. Finlayson-Pitts, J. W. Bottenheim, A. M. Grannas, and P. B. Shepson

"Molecular Halogens Before and During Ozone Depletion Events in the Arctic at Polar Sunrise: Concentrations and Sources." *Atmos. Environ.* 36:2721-2731. (This work was supported by DOE's Atmospheric Chemistry Program.)

Whiteman, C. D.

"A Temperature Minimum of -56°C: How does a Cold Air Pool Form in a Small, High Altitude, Limestone Sinkhole?" Presented at the University of Washington, Department of Atmospheric Science, April 5, 2002, Seattle, Washington.

Whiteman, C. D.

"Cold Pool Buildup in a Small Basin in Utah." Presented at the University of Freiburg, Meteorological Institute, May 15, 2002, Freiburg, Germany.

Whiteman, C. D.

"The Buildup of Cold Air Pools in Limestone Sinkholes." Presented at the University of Munich, Theoretical Meteorology Institute, June 5, 2002, Munich, Germany.

Xie, S. C., R. T. Cederwall, K.-M. Xu, P. Bechtold, D. G. Cripe, A. D. Del Genio, S. J. Ghan, D. Gregory, J. J. Hack, S. F. Jacobellis, S. A. Klein, S. K. Krueger, U. Lohmann, J. C. Petch, D. A. Randall, L. D. Rotstayn, R.J.C. Somerville, Y. C. Sud, K. von Salzen, G. K. Walker, A. Wolf, J. J. Yio, G. Zhang, and M. Zhang

"Intercomparison and Evaluation of Cumulus Parameterizations under Summertime Midlatitude Continental Conditions." *Q. J. Roy. Meteorol. Soc.* (in press).

Zhang, Y., R. C. Easter, S. J. Ghan, and H. Abdul-Razzak
"Impact of Aerosol Size Representation on Modeling Aerosol-Cloud Interactions." *J. Geophys. Res.* (in press).

Zhang, Y., R. C. Easter, S. J. Ghan, and H. Abdul-Razzak
"Impact of Aerosol Size Representation on Modeling Aerosol-Cloud Interactions." Presented at the GCSS/ARM Workshop, May 20-24, 2002, Kananaskis, Alberta, Canada.

The following papers were presented at the Phoenix 2001 Air Quality Study Data Workshop, April 2-3, 2002, Phoenix, Arizona:

Berkowitz, C. M. "Vertical Mixing and Chemistry Over an Arid Urban Site: First Results from the G-1 Aircraft and the Bank One Building Made During the Phoenix Sunrise Campaign."

Doran, J.C. "An Overview of Stability and NO_x/CO Observations During the Phoenix 2001 Campaign."

Fast, J.D. "Surface Meteorological Measurements and Ozone Profile Profiles During the ACP Phoenix 2001 Field Campaign."

The following papers were presented at the ARM Science Team Meeting, April 8-11, 2002, St. Petersburg, Florida:

- Ghan, S. J. "Testing a Cloud Condensation Nuclei Remote Sensing Method." (Poster presentation).
- Kassianov, E. I. "Brightness Fields in Statistically Inhomogeneous Clouds."
- Kassianov, E. I., T. P. Ackerman, and R. T. Marchand. "MISR-Derived Statistics of Cumulus Geometry at TWP Site."
- Kassianov, E. I., T. P. Ackerman, and P. Kollias. "The Role of Cloud Scale Resolution on Radiative Properties of Oceanic Low-Level Clouds."
- Kassianov, E. I., and C. N. Long. "ARM Total Sky Imager: Monte Carlo Simulations."
- Ovtchinnikov, M., and S. J. Ghan. "Effect of Subgrid Cloud Variability on Parameterization of Indirect Aerosol Effect in Large-Scale Models." Poster presentation at the ARM Science Team Meeting, April 8-11, 2002, St. Petersburg, Florida.

The following papers were presented at the 11th Conference on Atmospheric Radiation, June 3-7, 2002, Ogden, Utah:

- Mechem, D. B., M. Ovtchinnikov, Y. L. Kogan, A. B. Davis, R. F. Cahalan, E. E. Takara, and R. G. Ellingson. "Multi-Dimensional Broadband IR Radiative Forcing Of Marine Stratocumulus in a Large Eddy Simulation Model."
- Ovtchinnikov, M., D. B. Mechem, T. P. Ackerman, R. F. Cahalan, A. B. Davis, R. G. Ellingson, K. F. Evans, Y. L. Kogan, and E. E. Takara. "Longwave Cooling Rates in Inhomogeneous Stratocumulus Clouds: 3D Radiation Transfer Versus Independent Pixel Approximation Calculations."

The following papers were presented at the 10th Conference on Mountain Meteorology, June 17-21, 2002, Park City, Utah:

- Haiden, T., and C. D. Whiteman. "The Bulk Momentum Budget in Katabatic Flow: Observations and Hydraulic Model Results."
- Kossmann, M., C. D. Whiteman, and X. Bian. "Dynamic Airflow Channeling Over the Snake River Plain, Idaho."
- Steinacker, R., M., Dorninger, S. Eisenbach, A. M. Holzer, B. Pospichal, and C. D. Whiteman. "A Sinkhole Field Experiment in the Eastern Alps."
- Whiteman, C. D., S. Zhong, and R. Mayr. "Katabatic Flows on a Low-Angle Slope in the Salt Lake Valley – Overview of the VTMX 2000 Slope Experiment."
- Zhong, S., X. Bian, C. D. Whiteman, and S. Tanrikulu. "Thermally Driven Flows in California's Central Valley – A Comprehensive Analysis Using Data from a Dense Wind Profiler Network."
- Zhong, S., C. D. Whiteman, and T. Haiden. "How Well Can Mesoscale Models Capture Katabatic Flows Observed in a Large Valley?"