

ENVIRONMENTAL MEASUREMENTS LABORATORY

ANNUAL REPORT—FY2003

APRIL 2004



EML-623

ENVIRONMENTAL MEASUREMENTS LABORATORY

ANNUAL REPORT

FY2003

APRIL 2004



DISCLAIMER

“This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability nor responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.”

This report has been reproduced directly from the best available copy.

Available to the public from the U.S. Department of Commerce, Technology Administration, National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, (703) 487-4650.



DIRECTOR'S MESSAGE

I am pleased to present this overview of EML's FY 2003 accomplishments. As a federal laboratory in the Department of Homeland Security's Office of Research and Development, we are building upon, and applying, our expertise in radiation and radioactivity science to make significant contributions to the Department's mission to protect and secure our nation. We continue to build strong partnerships and work closely with the New York emergency response community as well as with other components of our nation's homeland security network. EML's staff has enthusiastically welcomed new opportunities to meet its mission and support the missions of the Department of Homeland Security.

In FY 2003, we transferred from the Department of Energy to the Department of Homeland Security as a federal laboratory within the Science and Technology Directorate. We examined our technical competencies, made strategic decisions regarding the program areas to build for the future, established a number of challenging goals, and instituted technical programs to meet these goals. This report discusses EML's activities and accomplishments under these homeland security projects. I am proud of our successes and am optimistic about our future as we stand by our commitment to continue our tradition of excellence and professional contributions.

A handwritten signature in black ink that reads "Mitchell D. Erickson". The signature is written in a cursive style.

Mitchell D. Erickson,
Director Environmental Measurements Laboratory

EML FY 2003 ANNUAL REPORT TABLE OF CONTENTS

EML'S IMPACT	1
RESEARCH, DEVELOPMENT, TEST AND EVALUATION IN RADIOLOGICAL AND NUCLEAR COUNTERMEASURES	2
CAPABILITIES FOR STATE AND LOCAL RESPONDERS AND OTHER DHS ELEMENTS	10
DEVELOPMENT AND IMPLEMENTATION OF STANDARDS	16
INTERNATIONAL COOPERATION AND NATIONAL DEFENSE	21
OTHER ACTIVITIES	23
EML PUBLICATIONS	33

EML'S IMPACT

EML's programs have been framed to focus on and fulfill its mission statement: The Environmental Measurements Laboratory advances and applies the science and technology required for preventing, protecting against, and responding to radiological and nuclear events in the service of Homeland and National Security.

EML provides the Department of Homeland Security (DHS) with environmental radiation and radioactivity measurements in the laboratory or field, technology development and evaluation, personnel training, instrument calibration, performance testing, data and program management, and data quality assurance.

To fulfill its mission, EML has integrated its projects into four capability areas aligned with the Science and Technology Directorate's goals and strategies:

- Research, Development, Test and Evaluation (RDT&E) in Radiological and Nuclear Countermeasures
- Capabilities for State and Local Responders and Other DHS Elements
- Development and Implementation of Standards
- International Cooperation and National Defense



Rollout of standards at JFK Airport

RESEARCH, DEVELOPMENT, TEST AND EVALUATION IN RADIOLOGICAL AND NUCLEAR COUNTERMEASURES

The Laboratory's efforts in research and development are part of the national efforts coordinated by the DHS/Science and Technology Directorate. New technologies are being developed for analysis, information sharing, interdiction, detection, response and consequence management involving radiological/nuclear attacks. EML's staff has a recognized and broad background in theoretical and experimental radiation physics, including detector response, spectrometry, surveys, long-term monitoring and field measurements involving alpha, beta, gamma and neutron radiation. EML supports the demonstration and deployment of advanced radiological measurement and survey methods to interdict and respond to radiological and nuclear threats.

Radiation Detection Equipment Field Trials

In cooperation with the Department of Homeland Security, New York City and metropolitan area authorities have been proactive in developing strategies and countermeasures to terrorism. Field trials are playing a key role in providing a link between the state and local users of technology and the developers of that technology and in establishing a transferable technology for countering and addressing the radiological/nuclear threat across the entire nation. EML's expertise and location have resulted in establishing unique relationships with local first responders to transition equipment from the developing and testing phases to operational field trials and has, in turn, provided a direct link to the Department.

Port Authority of New York and New Jersey (PANYNJ) Radiation Detection Equipment Field Trial

The DHS/S&T Directorate is utilizing PANYNJ facilities as test beds for technologies to detect weapons of mass destruction. This project initiated by DOE/NNSA was transferred to DHS in August 2003. A goal of the project is to provide a template for similar efforts in other major metropolitan areas across the country. A plan was established for the pilot deployment and field trials at the maritime, land and aviation transportation facilities operated by the PANYNJ using available, commercial off-the-shelf (COTS)



BNL Test Facility

radiation detection equipment as well as advanced sensor systems and prototypes being developed by DOE's national laboratories. Sandia, Lawrence Livermore and Los Alamos National Laboratories were selected as the scientific leads for developing the concept of operations for the installation and use of technologies at the facilities as well as for the analysis of the resulting data.

BNL Test Facility

The project included a pre-deployment testing phase at Brookhaven National Laboratory (BNL) using a variety of radiation sources under a variety of operational conditions. Using the ANSI Standard

N42.35, "Evaluation and Application of Radiation Detection Portal Monitors for Use in Homeland Security," for guidance (see Development and Implementation of Standards, below), the BNL Radiation Detector Testing and Evaluation Facility will produce normalized baseline data that can be used to compare the performance of the radiation detection system prior to the installation at the PANYNJ.

Program Management

EML has played a major and integral role in this project since its inception. EML's location and expertise enable a local federal presence for S&T in an ongoing and successful collaboration and interface with the Port Authority. EML, along with NNSA and now with DHS/S&T, led the planning effort for the overall



Test-bed venue deployment of radiation portal monitors

scope and execution of the project; identified, selected and purchased the COTS equipment; helped to define BNL's role and testing procedures and coordinated the involvement of the National Laboratories. Assistance was provided to the PANYNJ in the development of standard operating procedures and protocols to be used to respond to alarms that will follow federally-established guidelines and standards. EML also assisted the National Laboratories with the installation of equipment and overall project coordination with the PANYNJ, the PANYNJ facility

tenant operators, and the DHS/Bureau of Customs and Border Protection. Routine visits to the venues were made to obtain field status updates and to discuss issues and address concerns related to the project and to facilitate training, equipment installation and operation.

EML continues to serve as the primary point of contact and interface among all the participants in this project and will continue to manage and coordinate the field test activities at the PANYNJ. In FY 2004, a New York Project Office will be established to lead the implementation of the project. Activities will include field observations and assessments of the deployments, quality assurance/quality control activities, collecting and analyzing data from the field, and providing status and summary reports.

(Adam Hutter)

New York City Test Bed for Characterization Equipment

In FY 2002, EML installed a homeland security monitoring platform on its roof in New York City, supporting a suite of instruments to provide vital information in the event of a terrorist attack. Among the equipment mounted on this platform was a Comprehensive Radiation Sensor (CRS), a unique gamma radiation detector and spectroscopic analyzer which was developed by EML. (See summary below.) A data transfer system was constructed that transmits CRS gamma-ray spectra and ion chamber exposure rate measurements from the roof of the Varick Federal Office Building directly to a real-time web application. The unit on the monitoring platform has been supplying data continuously since November 2001 and can be viewed at <http://www.eml.doe.gov/homeland/location.cfm>



EML monitoring platform

The success of this platform, which has served as an operational test bed for newly-developed radiation sensor systems that can be used for search and characterization by local first responders, has paved the way for the development of a radiation monitoring network to respond to the need to transition equipment from the developing and testing phases to operational field trials. These systems will comprise newly-developed sensors, associated data transmission equipment, visual displays, other electronics, and information analysis and management software.

During FY 2003, EML collaborated with the New York City Office of Emergency Management and private corporations to identify potential sites in New York City for the deployment of radiation sensors as part of the EML New York City Radiation Monitoring Network demonstration project designed to mitigate the consequences resulting from a radiological terrorist attack. *(Colin Sanderson; Lawrence Ruth)*

Urban Atmospheric Observatory (UAO)

The consequences of an event involving dispersal of hazardous materials in the air are minimized when emergency managers have the capability to forecast the trajectory and dispersion of the cloud of hazardous agents. Since new techniques for predicting urban dispersion on real time scales are emerging, a real-time intensive Urban Atmospheric Observatory (UAO) is a needed step toward the development and validation of these new technologies. The proposed UAO will be a dense array of meteorological instrumentation and communications equipment that would provide the necessary data for dispersion model output. Along with radiation detectors and aerosol samplers, the instrument array will be placed in an urban canyon in the heart of Manhattan. The UAO will improve the understanding of atmospheric behavior not only for Manhattan, but ultimately for other dense canyon-like urban areas.

UAO Planning Meetings

The “First Planning Workshop on the Urban Atmospheric Observatory,” co-sponsored by EML and BNL, was held at EML in January 2003. This workshop brought together a group of experts that included the keynote speaker Edward Gabriel, Deputy Commissioner for Preparedness, New York



UAO workshop participants

City Office of Emergency Management. Presentations by invited speakers from academia, the national laboratories, and other government agencies introduced the UAO concept and focused on pertinent technologies and the state-of-the-art of atmospheric modeling for the urban environment. This workshop initiated the process of developing the overall program and designing a specific UAO plan.

As part of the national effort in this research area, EML attended the Urban Dispersion Model Working Group Meeting sponsored by the Defense Threat Reduction Agency at the U.S. Army Dugway Proving Ground in Salt Lake City, Utah. This meeting reviewed the accomplishments of the Urban 2000 experiment at Salt Lake City and the status of the Joint Urban 2003 experiment at Oklahoma City. In addition, plans for future urban modeling activities for FY 2004-2007 were discussed.

Initial UAO Installations

To gain experience in deployments in the Manhattan area for real-time meteorological measurements, EML, BNL and the National Oceanic and Atmospheric Administration (NOAA) began a pilot study in early FY 2003 that focused on turbulence effects and the interaction of small-scale air flow around buildings and in city canyons. BNL installed 3-D sonic anemometer wind sensors to compare wind velocities at three different heights on an urban building. BNL also installed a SODAR system at the rooftop for measuring the vertical profile of wind. The NOAA/ Air Resources Laboratory (ARL) provided instrumentation for measuring wind and turbulence and to cross-calibrate various instruments. The NOAA meteorological tower provided a fifth node on the National Weather Service Network for meteorological data for New York City. EML was responsible for the data collection and dissemination.



BNL sensors in foreground; NOAA tower in background

In FY 2003, EML worked toward an eventual UAO deployment in midtown Manhattan. Potential partners were contacted to participate in this multi-agency effort. Participants from government agencies, national laboratories, and academia will have expertise in modeling, meteorological instrumentation, monitoring, geographic information processing and atmospheric tracer experiments. This group effort will provide new modeling capabilities for deep urban canyons and also allow for the evaluation, improvement and validation of both wind and dispersion models. Also, the end-users will be trained to use these products in modeling, thus providing emergency managers and first-responders with the best available information regarding the spatial extent and timing of hazardous conditions.

Data Visualization to Support a UAO

Data display and model predictions for a UAO study will require advanced means of information viewing, particularly since it involves 3-D effects. The meteorological data being collected by the BNL instrument systems was incorporated in a display system that is posted to <http://review.eml.doe.gov/uao/>.

Data visualization needs were discussed with Hunter College of the City University of New York where detailed Geographical Information System (GIS) is available and with Urban Data Solutions, who provided 3-D data of buildings in New York City. In late FY 2003, EML collaborated with the State University of New York (SUNY) at Stony Brook to develop a preliminary software package involving a web-based GIS with a navigation tool for displaying real-time wind measurements. Currently, the package has been applied to an area of several blocks surrounding the EML building. Advances in 3-D visualization were projected that incorporate wind field modeling and hazardous concentration information to yield more realistic displays. (Sam Lee)

Background Radiation Evaluations

EML is recognized in the scientific community as a principal source of information on background levels of radiation and radioactivity in the environment. EML has performed evaluations of background radiation and radioactivity including natural terrestrial, cosmic, and anthropogenic sources to provide fundamental data on spatial and temporal variations. Background measurements will provide data needed to construct a baseline for cleanup criteria in the event of a radiological incident.

Neutron “Ship Effect” Studies

The “ship effect” is the increase in counting rate seen when neutron detectors are taken near ships, buildings, or other objects with large amounts of metal.

The “ship effect” interferes with detection, identification, and interdiction of hidden plutonium in such locations by giving false positive readings. It is caused by the interaction of high-energy cosmic-ray neutrons with large atomic nuclei such as iron or lead, which converts each normally undetectable high-energy neutron into many lower-energy, easily detectable neutrons. For almost a decade, EML has been measuring the energy distribution (spectrum) of cosmic-ray neutrons on airplanes and on the ground.

To make these measurements,

EML developed an extended-energy multisphere neutron spectrometer that measures the high-energy neutrons that had previously gone undetected. In FY 2003 the spectrometer was adapted for use on ships; calculations made of the response as a function of energy (response function) of each of the 14 detectors of the spectrometer in the altered configuration using the latest radiation transport software and nuclear data; and measurements made on the ground at several different altitudes and latitudes.



EML extended-energy multisphere neutron spectrometer

In FY 2004, EML will use its spectrometer to measure the cosmic-ray neutron spectrum under various conditions, including over water and land, away from, near, and on ships, and away from, near, and in buildings. Simultaneous measurements will be made with portable neutron detectors of the types used by the U.S. Coast Guard, Customs and Border Protection, and others in DHS and DOE to search for and identify clandestine nuclear materials. By correlating the two sets of measurements, EML will characterize and quantify the “ship effect” and determine expected changes in background count rates for various locations affected by the “ship effect.” This work should lead to improved detection of clandestine nuclear materials and significantly reduce the false positives that cause unnecessary mobilization of DHS and local responders and impede commerce.

(Paul Goldhagen)

Historic Radiological Dispersal Records

In cooperation with the National Cancer Institute (NCI) within the National Institutes of Health (NIH), EML’s hard copy records of gummed-film fallout monitoring data have been converted to electronic form. These unique and highly valuable records are over 8,000 pages in length, representing the results of fallout deposition measurements from up to 162 nationwide stations and an additional 100 other stations around the world that were operated in the 1950’s. These records are the only nationwide data available to conduct the congressionally mandated study on exposure of the U.S. population to ¹³¹I from nuclear weapons tests conducted at the Nevada Test Site. They remain the primary source of data with which to conduct any future related studies on dose reassessment and have increased relevance today in providing a historical frame of reference for the national impact of a wide-scale dispersal of radioactivity to the U.S. population. EML plans to provide the data as a searchable web-based database on the EML web site.

(Kevin Miller)



Gummed filter sampler on rooftop of USAEC Health and Safety Laboratory (now DHS/EML)

Sensor Testing and Evaluation

As federal technical experts, EML tests and evaluates radiation sensors and instrument systems that have applications to the interdiction of illicit radioactive and nuclear material, the assessment of dose following the release of radioactive material to the environment, and general health physics operations. Testing and evaluation covers attributes such as instrument applicability to a task, performance metrics, and ergonomic factors. EML’s facilities for testing include an environmental chamber, a shadow shield/angular response calibration bench, and a rooftop location for low-scatter neutron experiments and outdoor testing.

Gamma Instruments

At the request of the New York Police Department (NYPD) Counter Terrorism Division (CTD), EML conducted tests in FY 2003 of various devices that respond to gamma radiation. These included a Canberra Mini-Radiac and the Polimaster Gamma Master Watch. Both of these devices are used for personal radiation monitoring. Also, testing was performed with the Thermo-Electron PM1703M, a pager-size detector used for radioactive/nuclear material searches. The tests evaluated accuracy, precision, energy response, time response and effects of temperature extremes. The devices were also worn under typical use conditions in various background radiation fields to evaluate innocent/false alarm rates and other operational factors.

(Matthew Monetti; Peter Shebell)

Neutron Instruments

A Canberra Dineutron portable dose meter was evaluated by EML and compared with our standard commercial unit - the Studsvic 2202D. The testing involved time-resolved dose readings from both shielded and unshielded Cf fission sources as well as microphonic evaluations. EML's Comprehensive Radiation Sensor (CRS) was also evaluated for neutron sensitivity by examining the spectral response in the 5 to 8 meV range from n-gamma interactions in the detector and surrounding media. The CRS effective area for fission neutrons was compared with that from a standard He-3 detector.

(Matthew Monetti; Paul Bailey)



Experimental apparatus

Technology Development and Engineering

EML's staff has extensive experience and expertise in the design and construction of inexpensive and reliable innovative technologies, including the development of software for equipment interfacing and processing. EML's current efforts in technology development are focused on detectors and detection systems for nuclear and radiological threats. These systems comprise newly developed sensors, associated data transmission equipment, visual displays, other electronics, and information analysis and management software.



CRS on the EML roof platform

Comprehensive Radiation Sensor (CRS) Development

The Comprehensive Radiation Sensor (CRS), developed at EML, is a flexible gamma radiation detector/analyzer that functions both as a gross gamma detector, which alarms within 2 seconds of sensing an elevated radiation level, and as a spectrum analyzer which allows identification of specific radioisotopes. The combination of rapid response and high sensitivity makes these units excellent choices for area monitors and as interdiction devices. In addition, these units can serve as low-cost portal monitors. Simple assembly using off-the-shelf components keeps costs to a minimum. Building upon the success of the prototype CRS which has been supplying data continuously since November 2001, in FY 2003 EML evaluated three multichannel analyzer systems which could be integrated with a single board computer and a radiation detector system into a single weather-proof system. Evaluation of this integrated (2nd generation CRS) began in FY 2003 and is scheduled for environmental testing in FY 2004.

(Brian Albert; Colin Sanderson)

CAPABILITIES FOR STATE AND LOCAL RESPONDERS AND OTHER DHS ELEMENTS

EML provides information and guidance to law enforcement personnel, first responders and related elements in municipal, county, and state governments who are not experts in radiation and radioactivity. This assistance addresses various technical issues that arise in planning and field operations such as instrument or method applicability, performance characteristics, data interpretation and measurement program design. EML's outreach and assistance projects promote local responder and industry acceptance of field radiation measurement technologies and standards; disseminate information on developments in science and technology; identify opportunities for interagency cooperation; assist in the collection, interpretation and modeling of radiological/nuclear data; and facilitate feedback on field operational technology needs.

Technical Assistance and Local Outreach

As a field unit located in New York City, EML is in a unique position to provide outreach, training and technical assistance on radiation, radiation monitoring, and radiation protection to local and regional first responders and emergency management agencies. This local outreach provides a direct link from DHS to the operational-level and first responder organizations. EML responds to requests for assistance and advice from field operational units at the local, state and federal levels in dealing with radiation measurement issues. This on-going service, which has been welcomed and encouraged, is directed toward supporting both interdiction operations as well as emergency response planning.

New York Area Science and Technology Workgroup (NYAST)

In FY 2003, EML established the NYAST Workgroup and identified federal, state and local organizations in the New York metropolitan area that have an interest in science and technology for homeland security. This consortium meets to communicate the advances in and foster the application of science and technology that



NYAST panel discussions at 2nd topical meeting

will be used for homeland security. This Workgroup provides a direct link from DHS to the local operational-level organizations for conveying to law enforcement, emergency management and first responders, hospitals, and the private sector new information on developments in science and technology and receiving feedback on field operational experience. This DHS link will expedite the demonstration and ultimate deployment of instruments and methods that will be developed by the government and private sector in the coming years.

EML organized and hosted two topical meetings in FY 2003. The subject of the first topical meeting held in May 2003 was on the “Draft American National Standards for Radiation Detection Instrumentation for Homeland Security Applications” which included presentations relating to the overall DHS standards effort and specific draft standards for alarming personal radiation detectors, hand-held instruments, radioisotopic identifiers, and portal monitors.

The second topical meeting was held in September 2003 on “Background Ionizing Radiation.” This meeting covered basic information, techniques, and experiences regarding background measurements and included speakers from EML, the Remote Sensing Laboratory, the NYPD, the FDNY, the NYCOEM, and the NYC Department of Health and Mental Hygiene.

(Kevin Miller; Rita Rosen)

New York Police Department (NYPD) - Counter Terrorism Division (CTD)

The NYPD CTD has utilized EML as a technical resource on radiation measurements. Three projects of note were:

- The NYPD CTD is exploring the possibility of using airborne radiation detection as part of its overall program and requested EML’s assistance in establishing an aerial radiation detection capability. EML provided guidance and established points-of-contact for researchers at DOE’s Remote Sensing Laboratory (RSL) located at Andrews Air Force Base. RSL maintains the Aerial Measuring System that routinely utilizes its resources to conduct aerial surveys to collect, analyze, record and interpret environmental radiological data.
- To plan for the consequences of potential terrorist threats, EML scientists provided information specific to radiological dispersal devices (RDDs). The CTD used this information in planning a tabletop RDD exercise with the Police Commissioner and top level staff of the NYPD.
- EML has engaged in a joint study with the Lawrence Berkeley National Laboratory to evaluate whether air filters from police vehicles can be used to monitor for radionuclides and other illicit materials. In FY 2004, EML will prepare a number of air filter elements secured through the CTD from NYPD vehicles that operate in precincts in New York City’s five boroughs. These filters were collected during routine maintenance and represent temporally and spatially integrated large volume samples of air particulates that will undergo radionuclide and other analyses for illicit materials.

(Matthew Monetti)

New York City Office of Emergency Management (NYCOEM)

The New York City Office of Emergency Management is responsible for coordinating counter terrorism initiatives among local responders, such as the New York Police Department, the Fire Department of New York, and the New York City Department of Health and Mental Hygiene. In planning the New York/New Jersey Metropolitan Area Radiological Defense System, NYCOEM is interested in measuring radiation background in the New York City region to develop a background map. EML is recognized in the scientific

community as a principal source of information on background levels of radiation and radioactivity in the environment. In FY 2003, EML participated in an exchange of information and technical consultation for the creation of a Geographic Information System (GIS) database of background radiation in New York City using the Remote Sensing Laboratory's Aerial Measuring System or other past measurements. This database would be used to identify both legitimate and illicit point sources and areas of naturally-elevated radiation to meet objectives in radiological detection, prevention, response and recovery. EML continues to provide technical consultation as this concept develops.

(Matthew Monetti)

Fire Department of New York (FDNY)

EML responded to the FDNY's concerns with encountering radioactive materials during emergency and non-emergency calls and the needed information and guidance to address situations they and others might confront involving radiological dispersal devices, orphan sources, medical waste or radioactive materials from scientific research. EML developed a condensed, single-page list for some of the more common isotopes that might be encountered of Exposure Rate-Activity Conversion Factors. The FDNY HazMat and Emergency Operations Unit supply this information to all FDNY response vehicles that are equipped with commercial radiation detectors. Other groups that have expressed interest in this type of data include the NYCOEM and the FBI nuclear materials investigative units.

(Fabien Raccah)

New York City Department of Health and Mental Hygiene (NYC DOHMH)

EML provided information on air sampling and alarming dosimeters, particularly as it relates to aerosol measuring methods that could be used to estimate internal dose via the inhalation pathway in the event of first responder exposure to a radioactive debris cloud.

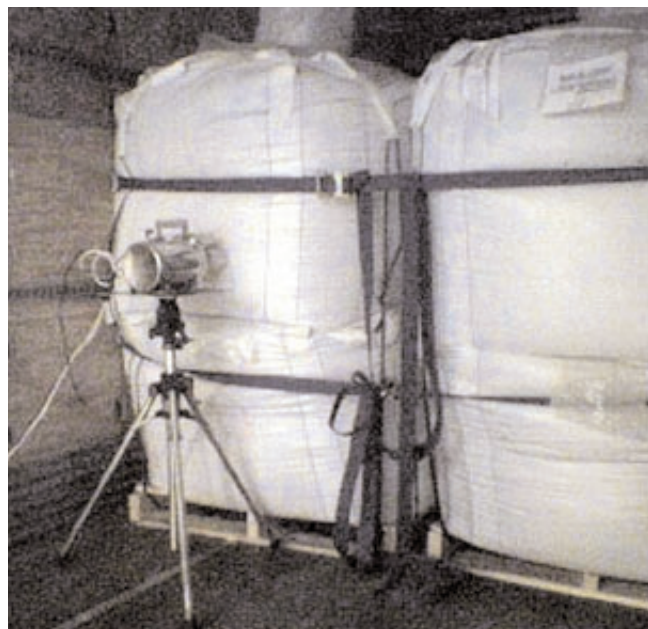
At the invitation of the DOHMH, EML scientists are members of the Nuclear Terrorism Subgroup of the Weapons of Mass Destruction Advisory Group. This subgroup focuses on emergency preparedness and response for first responders and hospitals related to bioterrorism and attacks involving RDDs.

EML scientists provided review and comment on two of the Nuclear Terrorism Subgroup's recently prepared draft documents: "Emergency Department and Hospital Triage" and "Assessment Protocols for Radiological Dispersal Device and Radiological Resource Manual."

(Fabien Raccah; Matthew Monetti; Kevin Miller)

DHS Bureau of Customs and Border Protection (CBP)

As a DHS technical center of expertise on radiation measurements and environmental assessment, EML performs technical assistance outreach functions to the local CBP facilities on radiological and nuclear issues as they pertain to detecting WMD at our borders. The Laboratory



EML HPGe system at the Fort Green Cargo facility

can draw from its experience in the areas of radiation detection instrumentation, survey/testing design, and quality assurance. From April 28 to May 2, 2003, EML assisted the Bureau of Customs and Border Protection in Operation Guardian at their Fort Street Cargo Facility, Ambassador Bridge Passenger Facility, and at the Detroit-Windsor Tunnel. The EML team operated a high purity germanium detector to provide high energy resolution gamma spectrometry capability to confirm secondary inspection findings for nuclide identification. EML's radiation detection instrumentation enhanced and expanded CBP's ability to detect illicit radioactive material, as well as to confirm the presence of elevated levels of naturally-occurring radioactive material in cargo, which is sometimes difficult to detect with a radiation isotope identifier device. *(Peter Shebell; Matthew Monetti)*

At the invitation of the Director of the Customs and Border Protection Applied Technology Division, an EML scientist participated in the review of the Radiation Portal Monitoring Program. This Program is part of CBP's efforts to implement the Congressional mandate to screen 100% of cargo arriving into the United States. *(Adam Hutter)*

DHS U.S. Coast Guard: Captain of the Port of New York and New Jersey— New York/New Jersey Radiological Monitoring Working Group

EML scientists are members of the NY/NJ Radiological Monitoring Working Group which consists of municipal, state and federal organizations with responsibilities or capabilities to measure and assess radioactivity releases to the environment. This collaboration is directed toward formulating protocols using Special Monitoring of Applied Response Technologies (SMART) for environmental monitoring following a radiological incident. SMART establishes a system for rapid collection and reporting of real-time, scientifically-based information to assist the Unified Command Structure with decision making during the initial phase of emergency response.

(Kevin Miller; Richard Larsen)

DHS U.S. Coast Guard Research and Development Center

The U.S. Coast Guard Research and Development Center evaluated commercial and government off-the-shelf radiation equipment for use by boarding and inspection personnel in detecting, localizing and identifying radioactive materials. At the invitation from the U.S. Coast Guard, EML attended the demonstration of these different technologies, equipment and capabilities and provided technical assistance and feedback at the working group meeting.

(Mitchell Erickson)



USCG demonstration participants

Interagency and Interstate Technical Workgroups

EML also provides technical assistance and outreach to first responders through another avenue at the federal and state level as the Science and Technology Directorate's Point-of-Contact on interagency and interstate technical working groups addressing issues related to post-event response. The technologies, methodologies and guidelines developed provide a nationally consistent consensus approach to conducting radiation surveys and investigations at potentially contaminated sites. EML scientists have actively participated in these working groups through the previous years. Continued participation supports the DHS mission and will help to foster cooperation and partnerships in mutual areas of interest.

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Workgroups

These workgroups are developing field and laboratory measurement guidelines to be used following a radiological release. In FY 2003, in conjunction with EPA, EML presented MARSSIM training courses attended by radiation protection professionals from federal and state agencies with responsibility for radiation site investigations and surveys. EML supported MARLAP in writing supplements to existing Chapters, especially as they relate to statistics and uncertainty issues.

(Carl Gogolak)

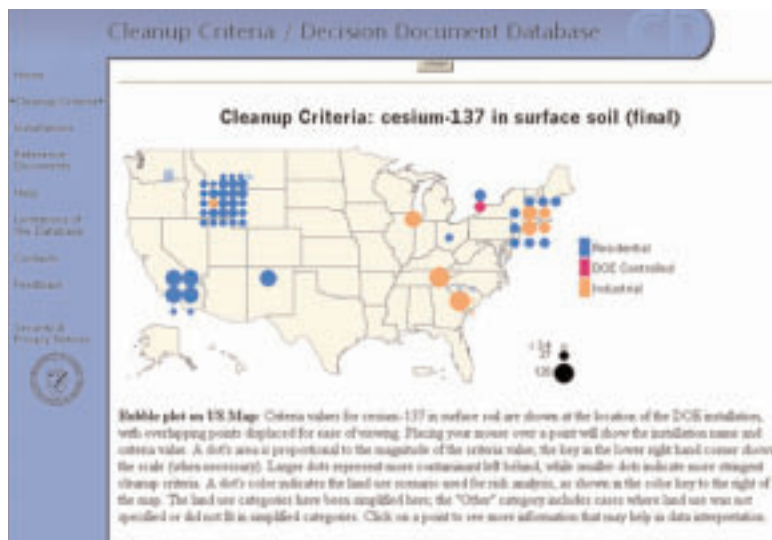
Spatial Analysis and Decisions Assistance (SADA)

In cooperation with the Nuclear Regulatory Commission (NRC) and the University of Tennessee (UT), EML is developing a geobayesian approach for supporting and characterizing 2D and 3D sampling designs. In March 2003, EML provided a technical basis document for these elements to be incorporated into the SADA software project being implemented at UT. In June, EML and UT conducted a workshop at the NRC on this topic. EML continues to consult with UT on the statistical sampling design and MARSSIM portions of the software. Beta testing will begin in FY 2004, and another workshop will be held in May 2004 with UT, the NRC and EPA

(Carl Gogolak)

Cleanup Criteria Decision Document (C2D2) Database

The Cleanup Criteria Database is a representative record of cleanup criteria agreements made by DOE that can provide a benchmark for response after a radiological terrorist event. Such data could play a key role in addressing public concerns and aid in establishing acceptable contaminant concentrations for safe re-use of the site after remediation. An analysis of RDD cleanup in the context of current regulations and existing cleanup criteria was completed and submitted for publication in a peer reviewed journal. The analysis examined ranges of and variations in agreed-upon criteria for ^{60}Co , ^{137}Cs , ^{226}Ra , ^{241}Am ,



C2D2 Web Display

and ⁹⁰Sr in surface soil, and the contribution of factors such as land use and dose goal. The database and user interface will be updated and expanded to address parameters of interest for RDD response.

(Gladys Klemic)

Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP)

These programs identify, develop and transition environmental technologies that relate directly to defense mission accomplishments. EML will continue to establish and maintain lines of communication and coordinate interaction between the Department of Defense and the Department of Homeland Security.

(Merrill Heit)

Exercises: Planning and Participation

EML has an established 55-year reputation and capability for fast response and expertise in radioactivity and radiation measurements and techniques which are vitally important in recovery operations. The expertise of the scientists at EML has resulted in invitations to participate as advisors or observers at various drills and tabletop exercises during FY 2003.

Unified Defense 04 Exercise

In FY 2003, EML was requested to participate in the Main Planning Conference for the Unified Defense 04 Exercise (UD04) being conducted by DoD's Northern Command. The UD04 is an interagency and state exercise that will include many DHS assets. EML will serve as a technical advisor for the nuclear detonation scenario of the exercise.

(Colin Sanderson)

United States Naval War College Exercise

The New York City Office of Emergency Management invited EML to observe the table-top exercise conducted by the United States Naval War College for participating agencies to develop their responses to a simulated terrorist event.

(Mitchell Erickson; Adam Hutter; Matthew Monetti)

Federal Radiological Monitoring and Assessment Center (FRMAC) Drill

EML observed a Consequence Management Drill at DOE's Remote Sensing Laboratory designed to provide hands-on experience to those responsible for the setup and operation of the DOE portion of the Federal Radiological Monitoring and Assessment Center (FRMAC). The drill scenario involved a release of radioactive material following a train collision and fire. Of interest was the demonstration of sample receipt/control and "hotline" operation.

(Anna Berne)

Operation Winter Sun

EML participated as an observer at the New York City "Operation Winter Sun," a chemical weapons full-scale exercise which involved a mock release of Sarin gas during the docking of a ferry. "Operation Winter Sun" afforded the opportunity to evaluate the City of New York's ability to establish communications, coordinate and integrate resources and test incident management protocols and procedures for a WMD incident.

(Fabien Raccach)

DEVELOPMENT AND IMPLEMENTATION OF STANDARDS

EML's technical staff has national and international experience in serving on consensus standards groups in the development of standards and guidance for radiation and radioactivity instruments and measurement methods.

Standards and Test Protocols for Radiological/Nuclear Countermeasures

DHS as well as state and local emergency response agencies are deploying a multitude of radiation measuring devices for interdiction and consequence management of radiological and nuclear agents. Standards are needed to insure that measurement objectives and system performance are appropriate and sufficient for the application and that some degree of consistency exists throughout the industry in terms of measurement units and hardware specifications. Standards are critical to avoid inconsistencies that could lead to ambiguous, misleading or erroneous data that will compromise interdiction programs to prevent a radiological/nuclear event and jeopardize the health and safety of first responders and the general public.

ANSI Standards for R/N Detection Equipment

In FY 2002, EML staff provided assistance in the development of road maps for the standards activities in the areas of equipment guidance documents, test protocols, test procedures, certification and training. The goal of this standards program is to develop comprehensive standards for the development, testing and certification of effective detection, response, remediation and forensics tools for radiological and nuclear materials. In FY 2003, EML staff became actively involved in developing comprehensive standards for the S&T Standards Office. EML staff served as members on the writing groups in cooperation with the National Institute of Standards and Technology (NIST) and the American National Standards Institute (ANSI) in the development of standards of four types of radiation detection equipment in the ANSI N42 series which, in turn, will enable DHS to provide guidance to local/state/federal homeland security entities regarding purchase, deployment and use of these tools.

- ANSI P-N42.32: Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security (*Paul Bailey*)
- ANSI P-N42.33: Portable Radiation Detection Instrumentation for Homeland Security (*Fabien Raccah*)
- ANSI P-N42.34: Performance Criteria for Hand-Held Instruments for the Detection and Identification of Radionuclides (*Peter Shebell*)
- ANSI P-42.35: Evaluation and Performance of Radiation Detection Portal Monitors for Use in Homeland Security (*Adam Hutter*)

Performance draft standards were developed after which they were “rolled out” to the user community, including first responders from federal, state and local agencies, and users in private industry. These presentations served to clarify the performance criteria and the scope of operations for radiation detectors as well as to provide a better understanding of the challenges to be met in the field by each of the user groups. EML scientists worked with a team from the DHS/Customs and Border Protection’s Laboratory and Scientific Services in Chicago to assess the applicability of these standards. The subject of the first New York Area Science and Technology (NYAST) Workgroup Topical Meeting was the “Draft American National Standards for Radiation Detection Instrumentation for Homeland Security Applications.” The draft standards

were also sent out for public comment prior to revision and balloting. These four Standards have been approved and will be available from ANSI.

Test and Evaluation Protocols for R/N Detection Equipment

In late FY 2003, EML participated in meetings to begin to formulate test and evaluation (T&E) protocols for the four classes of radiation detectors. In FY 2004, EML will develop the T&E protocols and will establish the appropriateness of these T&E protocols for use in laboratory and field testing at U.S. National Laboratories.

Council on Ionizing Radiation Measurements and Standards (CIRMS)

CIRMS is an independent, non-profit council that draws together experts involved in all aspects of ionizing radiation to discuss, review and assess developments and needs in this field. In early FY 2003, EML staff participated at the CIRMS Meeting held at the National Institute of Standards and Technology in Gaithersburg, MD. EML staff were co-leaders for a Homeland Security Workshop on “Standards for Selected Radiation/Nuclear Instrumentation;” chaired a session on “Stakeholders for Standards;” served as a moderator for the session on “Standards for Pagers;” and provided technical support for the breakout sessions. An EML scientist was appointed Co-Chair of the Radiation Protection Scientific Subcommittee.

(Pamela Greenlaw; Raymond Bath; Kevin Miller; Carl Gogolak)

Direct Support to DHS/ Science and Technology (S&T) Standards Office

EML staff provides support to S&T Headquarters in fulfilling programmatic functions and responsibilities. EML staff also provide, as federal technical experts, essential technical information needed for program development and strategic planning.

Standards Portfolio

EML provided direct support to the S&T Standards Office as Deputy Director of the Standards Portfolio. Responsibilities included program planning and execution; liaison with standards development organizations and specific standards workgroups; budget development; and execution facilitation. Among ongoing activities are the preparation of an FY04 “National Strategy for Radiological/Nuclear Response and Consequence Management.”

(Pamela Greenlaw)

Homeland Security Standards Database

EML provided technical assistance and support to the S&T Standards Office on a proposed project for an ANSI Homeland Security Standards Database. This database will provide users with a “search and retrieve” function of all published U.S. and international standards, as well as draft standards under development, that are available and related to homeland security. EML attended planning meetings and reviewed the database specification documents.

(Richard Larsen)

Cleanup of Radiological Dispersal Device (RDD) Dispersed Contamination

In response to a request for technical assistance, EML collaborated with NIST to provide feedback on cleanup of radioactive contamination dispersed by an RDD. To provide points of reference, EML scientists searched the C2D2 database for radionuclides that could be dispersed by an RDD, and looked at the range and

distribution of dose goals associated with them. Feedback was provided on various HQ-generated documents on the differences in the cleanup requirements between a regulated release and a terror related release.

(Paul Bailey; Gladys Klemic; Kevin Miller)

Consultation to NIST on Neutron Sources

In response to a request from the National Institute of Standards and Technology, EML provided advice, performed calculations, and co-authored a white paper covering neutron sources for both laboratory and field testing of instruments used to detect nuclear material.

(Paul Goldhagen; Paul Bailey)

Related Standards Activities

EML's technical staff has national and international experience in serving on consensus standards groups in the development of standards and guidance for radiation and radioactivity instruments and measurement methods. EML also has a long-standing reputation and performance in proficiency testing and intercomparison programs. A vital requirement is to ensure the readiness of state and local governments and private industry to provide reliable information after a terrorist attack. A network of fixed radiochemistry laboratories will be required to identify and quantify the radioactive material in the environs of the event. EML has continued to maintain its capability to assess the quality of the data produced by these radiochemistry laboratories and, in turn, provide assistance to DHS and other agencies.

Standards for R/N Measurements

EML continued its participation in the development of standards in the following areas:

- ASTM Committee C26.05: "Nuclear Fuel Cycle - Environmental Methods" *(Isabel Fisenne)*
- ANSI N13.37: "Environmental Thermoluminescent Dosimeters" *(Gladys Klemic)*
- ANSI N13.29: "Environmental Dosimetry - Performance Criteria for Testing" *(Gladys Klemic)*
- ANSI N42.RM: "Standard for In Situ Gamma-Ray Spectrometry" *(Peter Shebell)*
- ASTM D19.05: "Radiochemical Methods of Analysis for Water" *(Anna Berne)*

International Working Groups for Neutron Measurement Standards

EML is continuing to study the influence of background radiation on instruments used for interdiction of clandestine nuclear and radiological materials. Related to this effort are developments in the area of neutron dosimetry at aircraft altitudes. An EML scientist has been invited to become a member of two international working groups on neutron measurement standards:

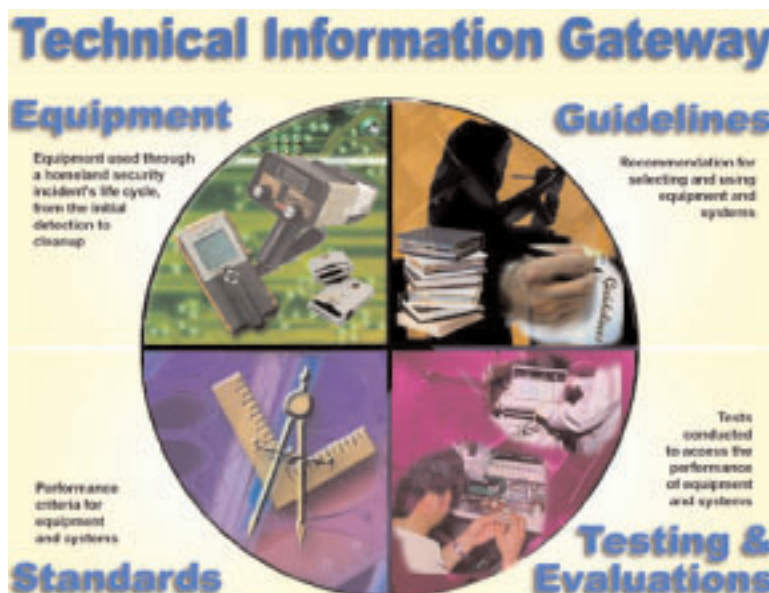
- Joint Task Group 50 of the International Commission on Radiological Protection / International Commission on Radiation Units and Measurements (ICRP/ICRU) on "Reference Doses from Cosmic Ray Exposure for Aircrew" and
- Working Group 21 of the International Organization for Standardization (ISO) on "Dosimetry for Exposures to Cosmic Radiation in Civilian Aircraft"

EML's expertise in this area was recognized by invitations to give presentations at the 2002 Joint Meeting of the Committee on Space Research (COSPAR) and the World Space Congress in Houston, Texas; the Ninth Neutron Dosimetry Symposium in Delft, Netherlands; the First International Expert Meeting/Workshop on

“Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies” held at Gif-sur-Yvette, France; and at the American Nuclear Society Winter Meeting in Washington, DC.
(Paul Goldhagen)

Technical Information Gateway

EML designed, developed and continues to populate the Technical Information Gateway, a database that provides expert guidance on commercial-off-the-shelf (COTS) equipment used to detect radiological threats. In addition to equipment classifications, lists, and specifications, the site also identifies applicable standards for the equipment, guidelines for selection of the equipment, and tests and evaluations conducted on the equipment. Information is added and maintained in the Gateway by EML Subject Matter Experts. The Technical



Gateway Web Display

Information Gateway is a means by which to disseminate S&T expertise to DHS stakeholders, including emergency responders, local/state/federal homeland security authorities and commercial entities. The database can be accessed via the EML Web Site (<http://www.eml.doe.gov>). An “Ask An Expert” feature was also added to the EML Web Site where users can submit questions related to radiological detection equipment to the EML Subject Matter Experts.

A similar web site database, the National Memorial Institute for the Prevention of Terrorism, Responder Knowledge Base (<http://www1.rkb.mipt.org>), supported by the DHS Office for Domestic Preparedness, also contains information for the emergency responder on currently available products, along with related information such as standards, training, and grants. Preliminary meetings were held to discuss a possible future role for EML in the Responder Knowledge Base.

(Richard Larsen)

Performance Testing for Radiological Laboratories

EML continued to serve as a Reference Laboratory for the National Institute of Standards and Technology (NIST) Radiological Traceability Program (RTP). EML is directly traceable to NIST for both the preparation and the characterization of performance evaluation (PE) materials as described in ANSI N42.23. In FY 2003, traceability to NIST was established for the preparation and characterization of water, soil and simulated air filter PE materials.

The EML Quality Assessment Program (QAP) provides a performance testing program for government contractor laboratories to substantiate their ability to analyze low-level radionuclides at cleanup sites. Laboratories routinely analyze soil, water, vegetation, and air filter samples, determining the type and quantity of gamma, alpha and beta emitting radionuclides present to meet cleanup criteria. More than 200 laboratories received samples in FY 2003. EML successfully completed the 58th and 59th QAP and published the results, both of which are available on-line at <http://www.eml.doe.gov>.

A paper was presented at the 48th Radiobioassay and Radiochemical Measurements Conference in Knoxville, TN, to show how the Quality Assessment Program database can be used in evaluating laboratories' competencies and how an individual laboratory's performance may be graded against the capabilities of the larger radiochemical community.

(Anna Berne)

EML Procedures Manual (HASL-300)

HASL-300 was first issued in 1957. New methods, including field collection and sampling methods, were added to the Manual through the years. Now in its 28th edition, HASL-300 remains a comprehensive resource for the scientific community. Radiochemical methods for analysis of water samples have been approved by EPA for use in compliance programs. Updates and additions are made directly on EML's web site. The Manual is available on CD-ROM upon request.

During FY 2003, EML fulfilled 37 requests for the Procedures Manual, 15 of which came from international institutes in Belgium, Bulgaria, Canada, China, France, Germany, India, Italy, Japan, Macedonia, Malaysia, South Africa, Spain, Sultanate of Oman, and Tanzania.

(Isabel Fisenne)

Emergency Response Capability

The Department of Health and Human Services Food and Drug Administration (FDA) has been tasked with developing a Food Emergency Response Network (FERN) to provide surge capacity analysis of food samples in the event of a radiological attack in the United States. EML's reputation and performance in proficiency and surveillance sampling programs led the Winchester Engineering and Analytical Center to invite EML to assist in the creation of this network. Milk samples, to which one or two radionuclides have been added, were sent to participating laboratories for analyses. "Surveillance" samples will be sent out several times a year to pulse the system. EML's participation in FERN is viewed as an adjunct to its own proficiency program which includes air, water and vegetation, but excludes milk. In FY 2003, EML participated in an interlaboratory proficiency test which required the measurement of ^{137}Cs in milk by gamma spectrometry.

(Isabel Fisenne)

INTERNATIONAL COOPERATION AND NATIONAL DEFENSE

Protecting the homeland goes beyond the borders of the United States. International cooperation is a key element in our national security initiative to gain information to identify radiological and nuclear threats and events throughout the world and to develop capabilities to combat and respond to terrorism.

Collaboration With The World Meteorological Organization's Global Atmosphere Watch

The World Meteorological Organization's (WMO) Global Atmosphere Watch (GAW) has designated EML as the World Calibration Center for Radioactivity. GAW is a coordinated network of meteorological stations and related facilities whose purpose and long-term goal is to provide data, scientific assessments, and other information on changes in the chemical composition and related physical characteristics of the atmosphere from all parts of the globe.

In FY 2003, EML collaborated with the WMO/GAW, the International Atomic Energy Agency, and the French Atomic Energy Commission to organize and co-sponsor the First International Expert Meeting/Workshop on "Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies," which was held at Gif-sur Yvette, France, in June 2003. Hsi-Na (Sam) Lee served as Co-Chair of the Executive Committee and Co-Organizer. Colin Sanderson served as a member of the Scientific Advisory Committee and Rapporteur during workshop discussions.

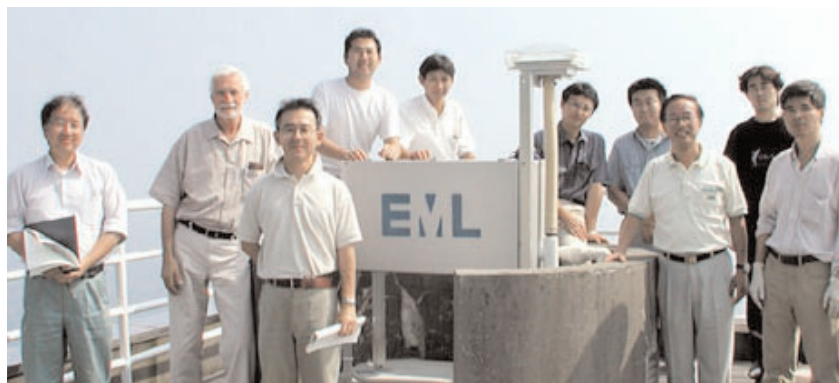
Invited papers by prominent scientists documented the current situation with respect to measurements of natural radionuclides and modeling of their global cycles as well as to make recommendations for improving sources, measurements and modeling. EML's expertise in this area was recognized by the invitation to present four papers at this meeting. A strategy was developed and written for improving the efficacy of natural radionuclide measurements and modeling. The proceedings of the meeting will be published in FY 2004. (Sam Lee; Colin Sanderson; Paul Goldhagen; Mitchell Erickson)

EML's Global Network

EML has long-standing experience in the development and deployment of remote and unattended radiation monitoring instruments in diverse and difficult locations. EML maintains a global network of aerosol sampling stations and deposition collection stations. Aerosol samples are regularly collected and sent to EML to be analyzed by gamma-ray spectrometry. The deposition samples are incorporated into EML's sample archive and are available for analysis as the need arises.

Data from the network is used to model the distribution and transport of natural and anthropogenic radionuclides in the atmosphere.

As a result of collaborations with the Japan Meteorological Agency in Tokyo, Japan, and the Meteorological Research Institute in Tsukuba, Japan, in



At Ryori, Japan

FY 2003 EML scientists installed EML's Remote Atmospheric Measurements Program (RAMP) equipment at Ryori, a Global Atmosphere Watch site in Japan. The RAMP System collects particulates and the filters are analyzed on site for radionuclides.

(Sam Lee; Colin Sanderson; Norman Chiu; Fabien Raccach; Matthew Monetti)

Collaboration With Japan Meteorology Research Institute (MRI)

In FY 2001, Hsi-Na (Sam) Lee's expertise in global atmospheric modeling was recognized by a research award from the Ministry of Education, Culture, Sports, Science and Technology Japan. In FY 2003, Dr. Lee was invited to again visit the Meteorological Research Institute (MRI) in Tsukuba, Japan, (see highlight on EML's Global Network) to work with scientists to improve their model calculations on the fate and global transport of atmospheric radionuclides and Asian dust. During his visit, Dr. Lee chaired the session on "Long Range Transport" and was invited to give two presentations at the 8th International Conference on Atmospheric Sciences and Applications to Air Quality.

(Sam Lee)

International Monitoring Systems Laboratory (IMS)

In FY 2000, EML established within its current facility a dedicated Radionuclide Laboratory in accordance with the requirements of the Provisional Technical Secretariat of the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO). High efficiency, high resolution gamma spectrometry systems and germanium well detectors and secure communication system are maintained as part of the dedicated laboratory for the analysis of air filter samples. In FY 2003, EML continued to function as the designated U.S. Laboratory in support of the radiological International Monitoring System which supports the CTBTO in Vienna, Austria. The Comprehensive Nuclear Test-Ban Treaty calls for 16 international laboratories to support the treaty.

EML scientists participated in the 2003 Radionuclide Laboratory Workshop in Gloggnitz, Austria. Other activities in FY 2003 included participation in the Gamma-Ray Analysis Exercise. This exercise required preliminary analysis results to be reported via the internet within two hours after receiving the electronic spectrum. Final results were to be reported within two weeks.

(Colin Sanderson; Pamela Greenlaw)

Measurement Assurance Programs for International Laboratories

The National Strategy for Homeland Security outlines a major initiative, "Help foreign nations fight terrorism." This initiative will provide the civilian authorities of other countries with specialized training and assistance in developing capabilities to combat and respond to terrorism. EML has provided a performance evaluation (PE) program for radiological measurements in environmental matrices (water, soil, vegetation and air filters) since 1976. Current participants include 51 laboratories from 26 countries in North and South America, the Middle East, Europe, Asia and Australia. Many of the participants are national centers for their countries. International participation in the program provides a means of assuring data comparability for data generated in response to an R/N event. At the same time, it is important for national security to foster cooperation among countries in other parts of the world, such as the Middle East, where a possibility of an incident is likely. For additional information on EML's Quality Assurance Program, see the section in this report on "Development and Implementation of Standards/Performance Testing for Radiological Laboratories."

(Anna Berne)

OTHER ACTIVITIES

DHS Visitors

During this transition year, EML was pleased to host visitors from DHS HQ and from other DHS elements, some of whom presented seminars to the staff.



John Marburger (*seated on left*), Science Advisor to the President and Director of the White House Office of Science and Technology Policy (March 2003)



Charles McQueary (*4th from left*), Under Secretary of the Science and Technology Directorate—lunch with invited EML senior and entry/mid-level technical and scientific staff (April 2003)



Tony Fainberg (*seated*), Director of Federal Laboratories
“Update on DHS Transition” (February 2003)



Michael Carter (2nd from left), Portfolio Manager for Radiological/Nuclear Countermeasures, “Radiological/Nuclear Roadmap” (November 2002)



Huban Gowadia (center), Radiological/Nuclear Countermeasures (April 2003)



Judy Kammeraad, Portfolio Manager for Radiological/Nuclear Countermeasures, “Radiological and Nuclear Countermeasures” (July 2003)



David Boyd (2nd from right), Deputy Director for Operations, Office of Research and Development (August 2003)



Holly Dockery, DHS/TPO S&T “Standards Roadmap” (November 2002)

Other Seminars

Jack McCready, R&D Center, U.S. Coast Guard, Groton, Connecticut, “The Coast Guard and the New Normalcy,” (January 2003)

Thomas Governo, New York Laboratory, Bureau of Customs and Border Protection. “Customs and Border Protection New York Laboratory,” (April 2003)

Nancy Suski, Portfolio Manager, Emergency Preparedness and Response, “Emergency Preparedness and Response, R&D Overview, (June 2003)

Reviews and Consultation

Review of SBIR Proposals on Radiation Detectors: EML was invited by the DOE Office of Defense Nuclear Nonproliferation to review Small Business Innovative Research (SBIR) proposals for a “Low-Cost Consequence Management Personal Radiation Detector.” The instruments are high sensitivity electronic dosimeters with an integrated Global Positioning System and radio uplink to a local data collection center. (Paul Bailey)

Guidance to Department of Labor: The media attention on Radiological Dispersal Devices (RDDs) or “Dirty Bombs” raised concerns among Department of Labor managers. At their invitation, EML gave a presentation and answered questions at an Executive Committee meeting of the Heads of the 15 agencies in the New York Regional Area. Information was provided on the nature of RDDs, the effects of their use, and protective actions that can be employed.

(Kevin Miller; Joseph Caroli)

Consultation to Royal Military College: EML provided consultation to the Royal Military College (RMC) in Canada on instrumentation that could be used to assess plutonium releases in the environment. The RMC is assisting the Canadian Navy’s Nuclear Emergency Response Team (NERT) on instrumentation for responding to an accident involving a nuclear weapon. Discussions focused on aerosol sampling with subsequent alpha measurements of filters and the use of FIDLERs for deposition measurements. EML also provided a point-of-contact at Bechtel-Nevada for further information that could be provided by DOE assets

such as the Radiological Assistance Program (RAP), the Nuclear Emergency Support Team (NEST), and the Accident Response Group (ARG).

(Kevin Miller; Paul Goldhagen)

Assistance to Remote Sensing Laboratory to Validate Data: At the request of the Remote Sensing Laboratory (RSL), EML confirmed the presence of elevated radioactivity at their east coast monitoring site in February 2003. It had been noted that EML's Homeland Security Web Site also had reported elevated radioactivity in New York City. After inspection of the spectral data obtained with EML's Comprehensive Radiation Sensor, it was determined that the radioactivity was the result of radon decay products washed out of the atmosphere by heavy precipitation during that time period.

(Colin Sanderson)

Meetings Organized and Sessions Chaired

Raymond Bath

Co-leader, Homeland Security Workshop on "Standards for Selected Radiation/Nuclear Instrumentation," 2002 Council of Ionizing Radiation Measurements and Standards (CIRMS), Gaithersburg, Maryland (October 20-22, 2002)

Chair, Session on "Stakeholders for Standards," 2002 Council of Ionizing Radiation Measurements and Standards (CIRMS), Gaithersburg, Maryland (October 20-22, 2002)

Anna Berne

Co-chair, Workshop on "QA/QC for Post-911 Readiness," 48th Annual Radiobioassay and Radiochemical Measurements Conference, Knoxville, Tennessee (November 11-15, 2002)

Paul Goldhagen

Co-chair, Session on "Spectrometry," Ninth Neutron Dosimetry Symposium, Delft, Netherlands (September 29, 2003)

Pamela Greenlaw

Co-leader, Homeland Security Workshop on "Standards for Selected Radiation/Nuclear Instrumentation," 2002 Council of Ionizing Radiation Measurements and Standards (CIRMS), Gaithersburg, Maryland (October 20-22, 2002)

Adam Hutter

Co-Organizer, Session on "Environmental Radioactivity," and Technical Program Committee Member, "Sixth International Conference on Methods and Applications of Radioanalytical Chemistry," Kailua-Kona, Hawaii (April 7-11, 2003)

Hsi-Na (Sam) Lee

Co-Organizer, First Planning Workshop on the "Urban Atmospheric Observatory: A Real-Time Intensive Observational Network for New York City," EML, New York City (January 27-28, 2003)

Chair, Session on "Long Range Transport," 8th International Conference on Atmospheric Sciences and Applications to Air Quality, Tsukuba, Japan (March 11-13, 2003)

Co-Organizer and Co-chair of Executive Committee, First International Expert Meeting/Workshop on "Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies," Gif-sur-Yvette, France (June 3-5, 2003)

Kevin Miller

Moderator, Session on “Standards for Pagers,” 2002 Council of Ionizing Radiation Measurements and Standards (CIRMS), Gaithersburg, Maryland (October 20-22)

Chair and Co-Organizer of New York Area Science and Technology Workgroup 1st Topical Meeting on “Draft American National Standards for Radiation Detection Instrumentation for Homeland Security Applications,” EML, New York City (May 21, 2003)

Chair and Co-Organizer of New York Area Science and Technology Workgroup 2nd Topical Meeting on “Background Ionizing Radiation,” EML, New York City (September 24, 2003)

Rita D. Rosen

Co-Organizer of New York Area Science and Technology Workgroup 1st Topical Meeting on “Draft American National Standards for Radiation Detection Instrumentation for Homeland Security Applications,” EML, New York City (May 21, 2003)

Co-Organizer of New York Area Science and Technology Workgroup 2nd Topical Meeting on “Background Ionizing Radiation,” EML, New York City (September 24, 2003)

Colin Sanderson

Member, Scientific Advisory Committee, First International Expert Meeting/Workshop on “Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies,” Gif-sur-Yvette, France (June 3-5)

Technical Seminars by Visiting Scientists

The seminar program at EML by visiting scientists keeps the scientific staff informed on programs and research in other institutions.

Thomas Graham, DOE NNSA/BNL, “Perspectives on DHS and Homeland Security Organizations” (October 4, 2002)

Christopher Marshall, NYU Medical Center, “Nuclear Terrorism: Hospital Liabilities and Assets” (October 23, 2002)

Maria Ranogajec, Ruder Boskovic Institute, Zagreb, Croatia, “Neutron Dosimetry With Chemical and Thermoluminescence Dosemeters” (November 20, 2002)

Paul D. Moskowitz, Brookhaven National Laboratory, “Radiation Detection and Nuclear Interdiction” (November 26, 2002)

Gerhardt Muller, U.S. Merchant Marine Academy at Kings Point, NY, “Containerization 101” (December 6, 2002)

Robert E. Hall, Brookhaven National Laboratory, “The Role of Technology on Infrastructure Assurance: The Smart Cities Program” (March 4, 2003)

Bruce Hicks, Air Resource Laboratory, NOAA, “The Air Resource Laboratory and the Department of Homeland Security” (May 13, 2003)

James L. Regens, University of Oklahoma, “Simulation Modeling of Anthrax Spore Dispersion in a Bioterrorism Incident” (May 15, 2003)

Lionel Zuckier, University of Medicine & Dentistry of N.J. School of Public Health, David Robinson, Rutgers University, “State-Wide Internet Based Network for Monitoring and Display of Weather and Environmental Radiation Data” (September 3, 2003)

James Anderson, Director, WeatherNet Business Services, AWS Convergence Technologies, “AWS National Network.” (September 12, 2003)

Eric Vowinkel, New Jersey District, U.S. Geological Survey, “Development of an Early Warning Decision Support System for Drinking Water Safety and Security: Incorporating Advanced Monitoring, Modeling, and Information Management” (September 30, 2003)

Presentations at NYAST Workgroup Topical Meetings

1st Topical Meeting - Draft American National Standards for Radiation Detection Instrumentation for Homeland Security Applications - May 21, 2003

Paul Bailey, EML “ANSI N42.32, Performance Criteria for Alarming Personal Radiation Detectors”

Bert Coursey, DHS/Science and Technology “Development of American National Standards for Radiation Detectors for Homeland Security”

Leticia Pibida, National Institute of Standards and Technology “ANSI N42.35, Evaluation and Application of Radiation Detection Portal Monitors for Use in Homeland Security”

Fabien Raccach, EML “ANSI N42.33, Performance Criteria for Handheld Radiation Detectors for Homeland Security”

Michael Unterweger, National Institute of Standards and Technology “ANSI N42.34, Performance Criteria for Handheld Instruments for the Detection and Identification of Radionuclides”

2nd Topical Meeting - Background Ionizing Radiation - September 24, 2003

Steven M. Donahoo, New York City Police Department Counter Terrorism Division “Experiences With the PM-1703 Alarming Ratemeter”

Kevin Miller, EML “Background Radiation Sources and Variations”

Luc Murphy, Remote Sensing Laboratory “Aerial Measuring System”

Presentations at Scientific Meetings

Paul Goldhagen

“Recent Results from Measurements of the Energy Spectrum of Cosmic-Ray Induced Neutrons Aboard an ER-2 Airplane and on the Ground,” 2002 Joint Meeting of the Committee on Space Research (COSPAR) and the World Space Congress, Houston, Texas (October 2002)

Paul Goldhagen

“Preliminary Validation of Computational Procedures for a New Atmospheric Ionizing Radiation (AIR) Model,” 2002 Joint Meeting of the Committee on Space Research (COSPAR) and the World Space Congress, Houston, Texas (October 2002)

Ada Kong

“The Determination of Total Uranium in Water by Kinetic Phosphorescence Analysis,” 48th Annual Conference on Bioassay, Analytical and Environmental Radiochemistry (BAER), Las Vegas, Nevada (November 2002)

Anna Berne

“The Use of Quality Assessment Program Results,” 48th Annual Radiobioassay and Radiochemical Measurements Conference, Knoxville, Tennessee (November 2002)

Raymond Lagomarsino

“A Spreadsheet for the Calculation of Strontium-90 Activity,” 48th Annual Radiobioassay and Radiochemical Measurements Conference, Knoxville, Tennessee (November 2002)

Raymond Bath

“Streamlined Approach to Measurement Using Project Level Evaluation Samples (SAMPLES) Concept Description” 48th Annual Radiobioassay and Radiochemical Measurements Conference, Knoxville, Tennessee (November 2002)

Raymond Bath

“Streamlined Approach to Measurement Using Project Level Evaluation Samples (SAMPLES) Proof-of-Concept Demonstration at BNL,” 48th Annual Radiobioassay and Radiochemical Measurements Conference, Knoxville, Tennessee (November 2002)

Isabel Fisenne

Invited: “Uranium in the Biosphere: What are the ‘Natural’ Concentrations?” American Nuclear Society Winter Meeting, Washington, DC (November 2002)

Paul Goldhagen

Invited: “Recent Results from Measurements of the Energy Spectrum of Cosmic-Ray Induced Neutrons Aboard a High-Altitude Airplane,” American Nuclear Society Winter Meeting, Washington, DC (November 2002)

Paul Goldhagen

“Recent Results From Measurements of the Energy Spectrum of Cosmic-Ray Induced Neutrons Aboard an ER-2 Airplane and on the Ground,” Neutron Radiation Department, Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany (December 2002)

Colin Sanderson

“A Radiological Monitoring Network for Homeland Security,” 2003 Mid-Year Meeting of the Health Physics Society, “Radiation Safety Aspects of Homeland Security Response,” San Antonio, Texas (January 2003)

Hsi-Na (Sam) Lee

Invited: “Natural Radionuclides (Pb-210 and Be-7) Collected in China for Validating Atmospheric Transport Models,” 8th International Conference on Atmospheric Sciences and Applications to Air Quality, Tsukuba, Japan (March 2003)

Hsi-Na (Sam) Lee

Invited: “Model Simulations of the Transport of Asian and Sahara Dusts: Total Deposition of Dust Masses in Japan,” 8th International Conference on Atmospheric Sciences and Applications to Air Quality, Tsukuba, Japan (March 2003)

Hsi-Na (Sam) Lee

Invited: “Issues and Challenges of Using Natural Radionuclides as Tracers for Atmospheric Studies,” First International Expert Meeting/Workshop on “Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies,” Gif-sur-Yvette, France (June 2003)

Colin Sanderson, Hsi-Na Lee

Invited: “EML Global Network for Measuring Radionuclides,” First International Expert Meeting/Workshop on “Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies,” Gif-sur-Yvette, France (June 2003)

Mitchell Erickson

Invited: “Recent Accomplishments at EML,” First International Expert Meeting/Workshop on “Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies,” Gif-sur-Yvette, France (June 2003)

Paul Goldhagen

Invited: “Measurements of Cosmic-Ray Neutron Spectra in the Stratosphere: A Benchmark for Calculations of Cosmogenic Nuclide Production,” (pre-recorded) First International Expert Meeting/Workshop on “Sources and Measurements of Natural Radionuclides Applied to Climate and Air Quality Studies,” Gif-sur-Yvette, France (June 2003)

Carl Gogolak

Invited: “Using MARSSIM Scenario B,” 48th Annual Meeting of the Health Physics Society, San Diego, California (July 2003)

Mitchell D. Erickson

“The Role of Science and Technology in Homeland Security,” Dioxin 2003, Boston, Massachusetts (August 2003)

Mitchell D. Erickson, Anna Berne, Adam Hutter, Richard Larsen, Hsi-Na Lee

Invited: “The Role of Science and Technology in Homeland Security,” American Chemical Society National Meeting: Symposium on Environmental Radioactivity and Low-Background Radioactivity Monitoring in Service to the Society, New York, New York (September 2003)

Carl Gogolak

Invited: “Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Supplements: Overview/Development Update,” American Chemical Society National Meeting: Symposium on Environmental Radioactivity and Low-Background Radioactivity Monitoring in Service to the Society, New York, New York (September 2003)

Carl Gogolak

Invited: “An Overview of the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual,” American Chemical Society National Meeting: Symposium on Environmental Radioactivity and Low-Background Radioactivity Monitoring in Service to the Society, New York, New York (September 2003)

Colin Sanderson

Invited: “A Radiological Monitoring Network for Homeland Security,” American Chemical Society National Meeting: Symposium on Environmental Radioactivity and Low-Background Radioactivity Monitoring in Service to the Society, New York, New York (September 2003)

Raymond Bath

Invited: “Department of Homeland Security, Standards Program: Radiation Measurements,” American Chemical Society National Meeting: Symposium on Environmental Radioactivity and Low-Background Radioactivity Monitoring in Service to the Society, New York, New York (September 2003)

Paul Goldhagen

“The Energy Spectrum of Cosmic-Ray Induced Neutrons Measured on an Airplane Over a Wide Range of Altitude and Latitude,” Ninth Neutron Dosimetry Symposium, Delft, Netherlands (September 2003)

Paul Goldhagen

“New Calculations of the Atmospheric Cosmic Radiation Field - Results for Neutron Spectra,” Ninth Neutron Dosimetry Symposium, Delft, Netherlands (September 2003)

Topical Talks at EML

Presentations at EML by EML staff keep the managers and scientific staff informed of progress in programs in the Laboratory as well as activities in related areas

Raymond Lagomarsino, “CW Agents: Type, Medical Characteristics, and Toxicity” (October 2002)

Paul Bailey, “Neutron Detection” (November 2002)

Gladys Klemic, “Radiation Quantities and Units for Homeland Security Standards” (November 2002)

Raymond Bath and Pamela Greenlaw, “Update of Activities at the Transition Office and EML’s Role in the New Department of Homeland Security” (January 2003)

Anna Berne, “The Use of Quality Assessment Program Results” (January 2003)

Paul Bailey, “Guidelines: What Are They? How To Write Them” (March 2003)

Alfred Cavallo, “The Container Security Working Group: Subgroup on Detection” (March 2003)

Richard Larsen and Ethel Jacob, “Technical Information Gateway: A Call for Content Managers” (March 2003)

Mitchell D. Erickson, “Briefing on the U.S. Coast Guard Technology Demonstration in Mobile, Alabama” (March 2003)

Hsi-Na (Sam) Lee, “Collaboration With Japanese Scientists On Modeling Global Transport of Radionuclides and Dust Aerosols” (April 2003)

Paul Bailey, “Portable Radiation Detectors Test and Evaluation Protocols: A Strawman Presented at NIST on March 26” (April 2003)

Paul Bailey, “Overview of Internet Technologies Used at EML” (April 2003)

Fabien Raccah, “An Overview of Operation Winter Sun” (June 2003)

Matthew Monetti, “Experiences With Operation Guardian” (June 2003)

Alfred Cavallo, “US Energy Security Issues” (June 2003)

Adam Hutter, “Port Authority of New York and New Jersey Radiation Detection Field Trial” (July 2003)

Kevin Miller, “Background Radiation Sources and Variations” (September 2003)

Fabien Raccach, “Gamma Constant and Activity Calculations of Specific Isotopes” (September 2003)

Committee and Outside Coordination Activities—National and International

(not included in main text)

Alfred Crescenzi

Member and Environmental Program Contact for EML, DHS National Environmental Policy Act (NEPA) Team

Isabel Fisenne

Member, Advisory Committee to the U.S. Uranium and Transuranium Registries Member, Editorial Advisory Board for “The Textbook on Radioanalytical Chemistry”

Merrill Heit

DOE Staff Representative to Interagency Arctic Research Policy Coordinating Committee (IARPC)

Peter Shebell

Member, Sampling, Characterization and Monitoring Team of Interstate Technology and Regulatory Cooperation

EML PUBLICATIONS

10/01/2002 TO 9/30/2003

- Allen-Gil, S. M., J. Ford, B. K. Lasorsa, M. A. Monetti, T. Vlasova, and D. H. Landers. "Heavy Metal Contamination in the Taimyr Peninsula, Siberian Arctic." *The Science of the Total Environment* (Jan. 2003): 301 119–38.
- Bailey, P. "Comparison of NaI and HPGe Minimum Detectable Activities." USDOE Report EML-619, Jan. 2003.
- Berne, A., and P. D. Greenlaw. "Semi-Annual Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program." USDOE Report EML-618, Dec. 2002.
- Cavallo, A. J. Letter to the Editor. "Protection of Residential Radon Lung Cancer Risks: The BEIR VI Risk Models conducted by Krewski et al. and Brand et al." *Radiation Protection Dosimetry* 102, 4, (Dec. 2002): 371–74.
- Clem, J. M., G. De Angelis, P. E. Goldhagen, and J. W. Wilson. "Development of a New Atmospheric Ionizing Radiation (AIR) Model." Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, pp. 369–75, Feb. 2003.
- , —, —, and —. "Preliminary Validation of Computational Procedures for a New Atmospheric Ionizing Radiation (AIR) Model." *Advances in Space Research* 32 (Jan. 2003): 27–33.
- De Angelis, G., J. M. Clem, P. E. Goldhagen, and J. W. Wilson. "A New Dynamical Atmospheric Ionizing Radiation (AIR) Model for Epidemiological Studies." *Advances in Space Research* 32, (Jan. 2003): 17–26.
- Erickson, L. E., P. Bailey, T. L. Kimball, and B. R. Morgan. "Stereochemistry of Platinum Complexes of the Neutral Amino Acids Allylglycine, S-methylcysteine, Methionine, and Corresponding Sulfoxides." *Inorganica Chimica Acta*, 346 (Mar. 2003): 169–80.
- Erickson, M. D. "EML Annual Report FY2002." USDOE Report EML-620, Feb. 2003.
- Goldhagen, P. "Cosmic-Ray Neutrons on the Ground and in the Atmosphere." *MRS Bulletin* 28 (Feb. 2003): 131–35.
- Goldhagen, P. E., J. M. Clem, and J. W. Wilson. "New Results from Measurements of the Energy Spectrum of Cosmic-Ray Induced Neutrons Aboard an ER-2 Airplane and on the Ground." *Advances in Space Research* 32 (Jan. 2003): 35–40.
- , —, and —. "Recent Results from Measurements of the Energy Spectrum of Cosmic-Ray Induced Neutrons Aboard an ER-2 Airplane (abstract)." *Am. Nucl. Soc. Transactions* 87 (Nov. 2002): 405.
- Goldhagen, P., T. Kniss, J. W. Wilson, R. C. Singleterry, I. W. Jones, and W. Van Steveninck. "Preliminary Analysis of the Multisphere Neutron Spectrometer." Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, pp. 165-85, Feb. 2003.

-
- Greenlaw, P. D., and A. Berne. "Semi-Annual Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program." USDOE Report EML-621, June 2003.
- Jones, I. W., J. W. Wilson, D. L. Maiden, P. Goldhagen, and J. L. Shinn. "AIR Instrument Array." Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, pp. 107–19, Feb. 2003.
- Klemic, G., P. Bailey, and D. Elcock. "A New Tool for Analysis of Cleanup Criteria Decisions." *Health Phys. (supplemental journal) Operational Radiation Safety (ORS)* 85 (Aug. 2003) S25–S30.
- Lee, H., T. Tanaka, M. Chiba, and Y. Igarashi. "Long Range Transport of Asian Dust from Storms and Its Impact on Japan." *Water, Air, and Soil Pollution: Focus* 3 (Mar. 2003) 231–43.
- Maiden, D. L., J. W. Wilson, I. W. Jones, and P. Goldhagen. "Atmospheric Ionizing Radiation and the High Speed Civil Transport." Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, pp. 1–25, Feb. 2003.
- Okty, S. D., D. J. Brabander, J. P. Smith, J. Kada, T. Bullen, and C. R. Olsen. "WTC Geochemical Fingerprint Recorded in New York Harbor Sediments." *EOS* 84 (Jan. 2003): 21–24.
- Wilson, J. W., P. E. Goldhagen, V. Rafnsson, J. M. Clem, G. De Angelis, and W. Friedberg. "Summary of Atmospheric Ionizing AIR Research: SST-Present." Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, pp. 387–407, Feb. 2003.
- , —, —, —, —, and —. "Overview of Atmospheric Ionizing Radiation (AIR) Research: SST-Present." *Advances in Space Research* 32, (Jan. 2003): 3-16.
- Wilson, J. W., I. W. Jones, D. L. Maiden, and P. Goldhagen, eds. Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, Feb. 2003.
- Wilson, J. W., D. L. Maiden, P. Goldhagen, H. Tai, and J. L. Shinn. "Overview of Atmospheric Ionizing Radiation (AIR)." Atmospheric Ionizing Radiation (AIR): Analysis, Results, and Lessons Learned from the June 1997 ER-2 Campaign, NASA Conference Proceeding. NASA/CP-2003-212155, pp. 27–105, Feb. 2003.



Environmental Measurements Laboratory
201 Varick Street, 5th floor, New York, NY 10014-7447
<http://www.eml.doe.gov>
