Curriculum Vitae
Paul E. Bieringer, Ph.D

1723 Madison CT · Louisville, Colorado, 80027
Home: (303) 997-6617 · Mobile (303) 250-7233 · paul.bieringer@gmail.com

Professional Overview

- Atmospheric scientist with applied and basic research experience
- Proven track record of delivering timely technical solutions to applied meteorological research problems
- Extensive background in meteorological analysis, algorithm development, radar signal processing, numerical weather prediction, data assimilation and adjoint models, and field data collection operations
- Published author, patent holder, and regular presenter at scientific conferences
- Experienced in developing research proposals, and managing a team of technical professionals
- Experienced consulting and forensic meteorologist with an emphasis in aviation meteorology

Education

Ph.D., Florida State University, Meteorology 2002
"The Use of Targeted Observations to Reduce Forecast Errors in the Presence of Terrain"

M.S., Florida State University, Meteorology 1997
"On The Interaction Between a Thunderstorm and its Near Storm Thermodynamic Environment"

B.S., University of North Dakota, Meteorology 1993

Professional Positions

Founder and Managing Director, Aeris LLC 3/2015 – Present

Chief Technical Officer, Science and Technology in Atmospheric Research (STAR) 6/2008 – 3/2015

Project Scientist III, National Center for Atmospheric Research (NCAR) 11/2013 – 3/2015

Project Scientist II, National Center for Atmospheric Research (NCAR) 6/2008 – 11/2013

Project Scientist I, National Center for Atmospheric Research (NCAR) 8/2007 – 6/2008

Associate Scientist III, National Center for Atmospheric Research (NCAR) 11/2006 – 8/2007

Technical Staff, Massachusetts Institute of Technology Lincoln Laboratory (MITLL) 6/2003 – 11/2006

Short Course Instructor, Massachusetts Institute of Technology Lincoln Laboratory (MITLL)
Topic: Numerical Weather Prediction (NWP) 9/2000 – 12/2000

Associate Staff, Massachusetts Institute of Technology Lincoln Laboratory (MITLL) 4/1999 – 6/2003

Assistant Staff, Massachusetts Institute of Technology Lincoln Laboratory (MITLL) 6/1995 – 4/1999

Technical Skills

Operating Systems:	LINUX High Performance Computing (HPC), Windows, MacOS
Programming Languages:	C, C++, FORTRAN, PERL, C-Shell scripts, Python, NCL
Software and Modeling Applications:	ARPS, MM5, MM5 Adjoint Model, WRF, WRF-LES, WRF-CHEM, GrADS, CONTAM, QUIC, MATLAB, Image processing
Miscellaneous Computer Knowledge:	Linux system administration, Networking, Hardware maintenance

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Forensic Analysis: Aviation accident/incident reconstruction using air-traffic control radar (target and weather channels), Doppler weather radar, satellite, surface, upper-air observational and atmospheric model data. Developer of custom-atmospheric modeling and software analysis solutions. Analysis and modeling of atmospheric transport, dispersion and source estimation for the release of airborne materials.

Consulting and Expert Analysis/Testimony

Maria Guadalupe Garcia, individually, et al. vs. Metro Aviation Inc., et al.	2009
Estate of Robert North vs. Precision Airmotive	2009 – 2011
Estate of Virgil Victor Becker Jr. vs. Precision Airmotive, et al.	2011 – 2013
- Provided a deposition on behalf of the defendant in August 2012.	
Rebecca Ramos-Colon vs. EADS North America et. al.	2012
Eileen M. Roberstson vs. Honeywell International Inc. et al.	2014 – 2015
Kaye Lynn Shenk, et al. vs. Cessna Aircraft Co., et al.	2014 – 2016

Security Clearances

Department of Defense (DoD) – Top Secret	2014 – Present
Intelligence Community (IC) – Secret Level	2012 – 2015
Department of Defense – Secret Level	2007 – Present
Department of Defense – Secret Level	1995 – 2006
Federal Aviation Administration Facility Access	2003 – 2006

Patents

U.S. Patent No.:	7,391,358	
Title:	"Weather Radar Echo Tops Forecast Generation"	
Inventors:	W.J. Dupree, M.M. Wolfson, R.J. Johnson Jr., R.A. Boldi, P.E. Bieringer, K.T. Calden, and C.A. Wilson	06/24/2008
U.S. Patent No.:	7,472,021	
Title:	"Atmospheric Feature Detection Using Lagrangian Scalar Integration"	
Inventors:	P. E. Bieringer and S. Winkler	12/30/2008

Awards

Title:	"Outstanding Platform Presentation"	
Location:	2011 Chemical and Biological Defense Science and Technology Conference – Las Vegas, NV	11/2011
Title:	"Lincoln Scholars Program"	
Location:	MIT Lincoln Laboratory – Lexington, MA	11/1999

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Honorary and Professional Organizations

American Meteorological Society
       - Chair of the AMS Committee on Meteorological Aspects of Air Pollution (CMAAP)   2013 – Present
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Selected Projects and Research Activities

Co-Principal Investigator   10/2015 – Present
Joint Program Manager for Information Systems (JPMIS), Joint Effects Model (JEM) Increment 2 (INC-2)
System Development (Aeris)
- Provide subject matter expertise on atmospheric dispersion and JEM system design
- Leading the team at Aeris that designs a new software framework for handling weather processing and atmospheric dispersion and integration with other model components

Principal Investigator   7/2015 – Present
US Government, Enhancing Signals of Interest Using Meteorological Modeling (Aeris)
- Continental scale atmospheric and transport and dispersion modeling
- Development of airborne material concentration background signals from near and far range sources
- Development of an algorithm to distinguish near range signals within a detailed long range concentration background

Principal Investigator   9/2015 – Present
Lawrence Berkeley National Laboratory, Coupled Indoor-Outdoor Contaminant Dispersion Modeling (Aeris)
- Provide subject matter expertise for linking indoor and outdoor contaminate dispersion models

Principal Investigator   9/2014 – 3/2015
US Government, Advanced Data Assimilation and Mesoscale Transport and Dispersion (ADAMTD) Modeling
(NCAR and STAR)
- Development of data assimilation enhancements for an operational ensemble numerical weather reanalysis system based on the Weather Research and Forecast (WRF) model
- Development of a "mission-specific" source estimation methods for the WRF system
- Development of enhancements to climatological analysis techniques

Principal Investigator   9/2014 – 3/2015
US Department of Homeland Security and Food and Drug Administration, Focused Integration of Data for Early
Signals (FIDES) (NCAR)
- Development of methodologies for incorporating weather and climate information into a food security scanning and analysis capability that will be used for monitoring potential food threats associated with changing meteorological conditions

Principal Investigator   8/2013 – 3/2015
Defense Threat Reduction Agency, Disease Vector Mapping via Environmental/Climatological/Sociological
Factors, (NCAR and STAR)
- Conduct a climatological analysis of meteorological conditions in Veracruz, Mexico
- Conduct an on-site field survey of mosquito breeding containers and environmental conditions in Veracruz, Mexico
- Develop a high-resolution satellite image processing algorithm to identify and categorize mosquito breeding habitats
- Integrate environmental and satellite imagery with models of container temperatures, mosquito reproduction, and disease spread into a coupled system

Results used to develop an extensible dynamically updating dengue disease risk map that can be combined with other medical source information in a DoD biosurveillence system

Principal Investigator   5/2013 – 3/2015
Joint Program Manager for Information Systems (JPMIS), Joint Effects Model (JEM) Increment 2 (INC-2) System Development (STAR)
- Provide subject matter expertise on atmospheric dispersion and JEM system design
- Design of a new software framework for handling weather processing and atmospheric dispersion
- Decoupling of the JEM weather processor (SWIM) from the dispersion model (SCIPUFF)
- Re-engineering and integration of incident source model (ISM) with SWIM and SCIPUFF

Principal Investigator   11/2012 – 11/2013
National Science Foundation, International Workshop on Source Term Estimation (STE) Methods for Estimating the Atmospheric Radiation Release From the Fukushima Daiichi Nuclear Power Plant (NCAR)
- Organize and conduct a workshop to discuss STE methods for the Fukushima incident
- Publish the results/findings for the benefit of the scientific community

Principal Investigator   9/2012 – 3/2015
US Government, Current Climate Downscaling and Reanalysis Program (STAR)
- Development of a hardware/software system for developing on-demand 30+ year climate reanalyses for any location in the world
- Development of new data post-processing techniques which reduce the dimensionality of the climate data to a manageable set of "representative weather conditions"
- Development of post-processing techniques for extracting mission-specific information from the representative weather conditions

Principal Investigator   5/2011 – 3/2015
US Government, Ensemble Numerical Weather Reanalysis and Long Range Source Term Estimation (STAR)
- Development of recommendations for configuring an operational ensemble numerical weather reanalysis system based on the Weather Research and Forecast (WRF) model
- Development of a "mission-specific" in-line tracer capability for the E-WRF system
- Development of algorithms for the determination of release rates for the release of airborne contaminants from observations located at long ranges from the release location

Principal Investigator   11/2006 – 3/2015
Defense Threat Reduction Agency, Sensor Data Fusion Program, (NCAR)
- Fusion Field Test 2007 field program planning support
  - Conducted a probability of detection analysis for the anticipated release scenarios. Results will be used to as planning guidance during the field program tests.
- Virtual Threat Response Emulation and Analysis Testbed (VTHREAT) prototype development
  - Developed a proof of concept demonstration of a virtual environmental simulation testbed that can be used to test and refine transport and dispersion and chemical/biological/radiological (CBR) sensor data fusion algorithms.
- CBR sensor data fusion algorithm development
  - Developing an operational algorithm that uses variational techniques to incorporate CBR and meteorological sensor data to produce an improved CBR source location estimate and corresponding transport and dispersion solution.

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Principal Investigator 1/2010 – 10/2012
Department of Homeland Security, Site Specific Risk Assessment (SSRA) for the National Bio – Agriculture Research Facility (NBAF), (STAR)
- Conduct a climatological analysis of meteorological conditions at the NBAF
- Conduct a risk assessment for the likelihood of a tornado impact of the facility
- Conduct dispersion simulations for a series of material releases from the NBAF
  - Results used as part of a comprehensive epidemiological and economic modeling effort to ascertain the impact of hazardous materials being released from the NBAF.
- Briefed the National Academy of Sciences on risk assessment results

Principal Investigator 5/2009 – 10/2013
Defense Threat Reduction Agency, Contamination Avoidance System Testing Tool, (STAR)
- Development of a virtual chemical/biological (CB) agent and meteorological environmental simulations and test and evaluation tool to support the evaluation of CB contamination avoidance assets.
  - Results used to support the interpretation of chemical samples collected during the field program
  - Utilizes computational fluid dynamics and large eddy simulation models to produce physically realistic "single realization" synthetic CB and meteorological data sets.

Principal Investigator 2/2009 – 10/2010
Defense Advanced Research Projects Agency, Subcontract to Signature Science Inc. POSSE Chemical Detection Experiment 2 (STAR)
- Meteorological sensing support for an experiment designed to detect the manufacturing of improvised explosive device manufacturing.
  - Manages the design, deployment, and collection of data collected during the field program
  - Results will like be used to support simulations of the dispersion of chemical associated with IED construction.

Principal Investigator 7/2008
Defense Advanced Research Projects Agency, Subcontract to Signature Science Inc. POSSE Chemical Detection Experiment 1 (STAR)
- Modeling the dispersion of chemicals associated with improvised explosive device manufacturing within and outside of buildings.
  - Results used to support the interpretation of chemical samples collected during the field program and for field program planning

Principal Investigator 10/2007
Defense Advanced Research Projects Agency, Atmospheric Chemical Mapping Program, (NCAR)
- Evaluating enabling technologies using an observation systems simulation experiment
  - Conducting an evaluation of sampler requirements for a atmospheric chemical mapping system.
  - Evaluating source estimation and models to augment observations in an atmospheric chemical map.

Research Scientist 11/2006
Pentagon Force Protection Agency, Pentagon/Urban Shield Program, (NCAR)
- Pentagon/Urban Shield domain expansion
  - Conducted an analysis which identified and minimized the errors associated with producing a large domain composite building aware wind fields from a set of smaller sub-domains.

Senior Algorithm Development Team Member 6/2003
FAA Convective Weather Forecast (CWF) Product, (MITLL)
- Automated synoptic front detection algorithm

- Developed and implemented an automated front detection algorithm that identifies fronts along which new convective storms may develop. This system uses temporal filtering and image processing techniques to produce an interest image that will be utilized by the automated convective weather forecast algorithm.
- Boundary layer wind analysis system
  - Managed a team that developed and implemented a prototype large domain boundary layer wind analysis system.
  - The prototype utilizes high temporal frequency surface observations, and data from 15 Doppler weather radars to produce a real-time gridded 1 km resolution wind analysis with a 5 minute update, that covered a 500 x 500 km domain centered over Chicago, IL.
- Utilization of NWP data in the 0-2 hour automated CWF system
  - Set up an operational implementation of 5th Generation Mesoscale Model (MM5) on a 46 processor Intel based BEOWULF HPCC.
  - Managed a team of intern students where we optimized the performance of MM5 on Intel hardware. Hardware and software setting modifications identified by this study provided simulation speed improvements of ~ 25-30 %.
  - Collaborated with Dell engineers to utilize an Infiniband high speed network switch with MM5. Final solution provided network bandwidth comparable to Myrinet at 1/3 the cost.
  - Developed software infrastructure required to feed MM5 data to the real-time convective weather forecast system

Senior Algorithm Development Team Member   3/2004
FAA Terminal Ceiling and Visibility (TC&V) Forecast Product, (MITLL)
- NWP forecast accuracy analysis
  - Developed an analysis software system (PERL and GRADS) to characterize TC&V forecast performance of Rapid Update Cycle (RUC), and MM5 relative to human and persistence forecasts.
- NWP C&V forecast generation system
  - NWP forecast accuracy analysis results were used to design and implement an operational system that produces a 12-hour TC&V forecast time line from the NWP forecast.
- NWP forecast accuracy through post analysis image processing
  - Current work examines how NWP TC&V forecasts can be improved during event transition times by identifying and removing spatial and temporal forecast biases.

Co-Principal Investigator   11/2005
Model validation for Millimeter-Wave Precipitation Mapping, (MITLL Advanced Concepts Committee Program)
- Sensor validation and translation algorithm refinement
  - Validation of passive microwave radiometer data to demonstrate its potential use as a global space-based precipitation mapping instrument.
  - Produced tailored MM5 simulations to refine radiative transfer models and translation algorithms.

Co-Principal Investigator   3/2004 – 5/2005
A Lagrangian Approach to Atmospheric Feature Detection, (MITLL Advanced Concepts Committee Program)
- Algorithm development
  - Tailored MM5 simulations generated to serve as analysis input and truth data sets.
  - Demonstrated frontal detection accuracy and signal/noise ratio improvements derived from a new Lagrangian temporal filtering technique.
  - Lead patent holder for a Lagrangian temporal filtering technique.

Ph.D. Candidate, Lincoln Scholars Doctoral Research Program   1/2000 – 12/2002
Florida State University, Department of Meteorology
"Examination of the Effects of Topographic Variability on Initial Condition Sensitivity in a Mesoscale Numerical Weather Prediction Model"

- Accepted into the Lincoln Scholars Doctoral Program
- Field site operations
  - Designed a mesoscale NWP targeted observation study that utilized data from a partially deployed surface mesonet and Doppler weather radar.
  - Completed the mesonet deployment.
  - Operated a mesonet of surface observation stations (connected via RF radio) in the Berkshire Mountains in western MA.
  - Deployed and maintained the network infrastructure to relay observations from the field site to the main laboratory in Lexington, MA.
  - Developed the software to collect and process the mesonet data, data from the KENX WSR-88D, and NWP data.
- NWP initial condition sensitivity (ICS) study
  - Conducted an observation simulation system experiment (OSSE) ICS using MM5 and its Adjoint Modeling System to study forecast sensitivities associated with terrain variability.
  - Developed software to modify MM5 initial condition data sets.
  - Utilized MM5 Adjoint Modeling System to identify regions of initial condition sensitivity in the model simulations.
  - Retrieved wind data from the WSR-88D served as the targeted observations in the sensitive regions.
  - Utilized surface mesonet data as ground truth.
  - Results of the observation based study confirmed the results of the OSSE study and showed a positive correlation between terrain variability and the magnitude of the positive impact on the forecast made by the initial condition fields.

Field Site Manager, Software Developer, Data Analyst   7/1998 – 6/2003
Air Surveillance Radar 11 / Digital Air Surveillance Radar (ASR-11/DASR) Weather Channel Acceptance Test and Evaluation Program, (MITLL)
- Field site operations
  - Designed, developed, deployed, and operated the equipment and software required to collect weather data from the ASR-11 and nearby WSR-88D radars for three field sites (Eglin AFB, FL, Stockton Regional Airport, CA, and West Palm Beach International Airport, FL). Developed data collection software (C, PERL, and C-shell scripts) that provided archival and real-time data display capabilities.
  - Managed field site staff.
- ASR-11 performance evaluation analysis
  - Developed software (C and PERL) to provide radar performance characteristics to evaluate the bias and error properties of the precipitation measurements.
  - Monitored real-time observations to identify ASR-11 weather channel deficiencies.
  - Worked closely with sponsor and government contractors to correct the deficiencies.
  - Regularly wrote reports, briefed the FAA program managers on analysis results and recommended solutions to deficiencies.

Field Site Operations and Data Analyst   6/1995 – 7/1998
Terminal Doppler Weather Radar (TDWR) and Integrated Terminal Weather Information System (ITWS) System Development Prototype at the Orlando International Airport
- Field site operations
  - Assisted in the operations of the ITWS prototype system
  - Maintained computer software and communications networks
  - Deployed equipment in FAA facilities
  - Conducted training on the use of the ITWS with FAA employees
- ITWS performance evaluation analysis
  - Conducted data analysis support the performance evaluation of wind shear and meteorological algorithms in ITWS

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- Conducted post weather event aviation impact analyses to identify areas for improving the safety and efficiency of airport terminal operations
- Regularly wrote reports, briefed the FAA program managers on analysis results and recommended solutions to deficiencies.

Accepted/Published Refereed Journal Publications

Bieringer, P.E., and P.S. Ray, 1996: A comparison of Tornado Warning Lead Times with and without NEXRAD Doppler Radar. *Weather and Forecast*, **11**, pp 47-52.

Ray P.S., **P.E. Bieringer**, X. Niu, and B. Whissel, 2003: An Improved Estimate of Tornado Occurrence in the United States. *Mon Wea. Rev*., **131**, pp 1026-1031.

Xie, Y., S. Koch, J. McGinley, S. Albers, **P.E. Bieringer**, M. Wolfson, M. Chan, 2011: A space–time multiscale analysis system: a sequential variational analysis approach. *Mon. Wea. Rev.*, **139**, 1224–1240.

Platt, N., D. DeRiggi, S. Warner, **P.E. Bieringer**, G. Bieberbach, A. Wyszogrodzki, and J. Weil, 2012: Method for comparison of large eddy simulation generated wind fluctuations with short-range observations, *Int. J. Environ. Pollut.,* Vol. 48, No. 1/2/3/4, pp.22–30.

Rodriguez, L.M., **P.E. Bieringer**, T.Warner 2013: Urban transport and dispersion model sensitivity to wind direction uncertainty and source location, *Atmos. Environ.*, Vol. 64, January 2013, Pages 25-39, ISSN 1352-2310, 10.1016/j.atmosenv.2012.08.037.

Bieringer, P.E., S. Hanna, G. Young, B. Kosovic, J. Hannan, and R. Ohba, 2013: Methods for Estimating the Atmospheric Radiation Release from the Fukushima Dai-ichi Nuclear Power Plant. *Bull. Amer. Meteor. Soc.,* **94.**

Bieringer P.E., P.S. Ray, A.J. Annunzio, 2013. The Effect Of Topographic Variability On Initial Condition Sensitivity Of Low-Level Wind Forecasts Part 1: Experiments Using Idealized Terrain. *Mon Wea. Rev*., **141**, pp 2137-2155.

Bieringer P.E., P.S. Ray, A.J. Annunzio, 2013. The Effect Of Topographic Variability On Initial Condition Sensitivity Of Low-Level Wind Forecasts Part II: Experiments Using Real Terrain And Observations. *Mon Wea. Rev*., **141**, pp. 2156-2172.

Bieringer, P.E., S. Longmore, G. Bieberbach, L.M. Rodriguez, J, Copeland, and J. Hannan, 2013: A Method for Targeting Air Samplers for Facility Monitoring in an Urban Environment. *Atmos. Environ.*, **80**, pp. 1-12.

Bieringer, P. E., A. J. Annunzio, N. Platt, G. Bieberbach, J. Hannan, 2014: Contrasting the use of single-realization versus ensemble-average atmospheric dispersion solutions for chemical and biological defense analyses. *J. Appl. Meteor. Climatol*., **53,** 1399–1415. doi: http://dx.doi.org/10.1175/JAMC-D-13-0201.1

Eisen, L. A. J. Monaghan, S. Lozano-Fuentes, D. F. Steinhoff, M. H. Hayden, and P. E. Bieringer, 2014: The Impact of Temperature on the Bionomics of the Vector Mosquito *Aedes (Stegomyia) aegypti,* With Special Reference to the Cool Geographic Range Margins. *J. Med. Entomol.,* **51,** No 3., pp 1-21.

Urban, J. T., K. Galvin, N. Platt, **P.E. Bieringer**, G. Bieberbach, A.J. Annunzio, 2014: Comparison of hazard area and casualty predictions of a small-scale chemical attack using various toxic load toxicity models., *Int. J. Environ. Pollut.,* **54**, No.2/3/4, pp.222 – 232.

Nunalee, C.G., B. Kosovic, **P.E. Bieringer**, 2014: Evaluation of WRF-LES for Dispersion and Transport Modeling Over Complex Terrain, *Atmos. Environ.,* **99,** pp. 571-581*,* ISSN 1352-2310, http://dx.doi.org/10.1016/j.atmosenv.2014.09.070.

Bieringer, P.E., F. Vandenberghe, I. Sykes, J. Hannan, J. Hurst, G. Bieberbach, L.M. Rodriguez, and R. Fry, 2015: Automated Source Parameter and Low Level Wind Estimation for Atmospheric Transport and Dispersion Applications., *Atmos. Environ.* **122,** pp. 206-219.

Herring, S. J., S. Batchelor, **P. E. Bieringer**, B. Lingard, D. M. Lorenzetti, S. T. Parker, L. Rodriguez, M. D. Sohn, D. Steinhoff, M. Wolski, 2015: Providing Pressure Inputs to Multizone Building Models., *Building and Environment*, **101,** pp. 32-44.

Nelson, M.A., M.J. Brown, S.A. Halverson, **P.E. Bieringer**, A.J. Annunzio, G. Bieberbach, 2016: Assimilation of WRF Meso-Scale Meteorological Simulations into the QUIC Atmospheric Dispersion Modeling System. Part 1: Wind and Turbulence. *Bound-Lay. Meteorol,,* **158,** Issue 2, pp. 285-309.

Nelson, M.A., M.J. Brown, S.A. Halverson, **P.E. Bieringer**, A.J. Annunzio, G. Bieberbach, 2016: A Case Study of the Weather Research and Forecasting Model Applied to the Joint Urban 2003 Tracer Field Experiment. Part 2: Contaminant Dispersion. *Bound-Lay. Meteorol., Available online July 2016.*

Kim, M., R. Ohba, M. Oura, S. Kato, M. Takigawa, **P.E. Bieringer**, B. Lauritzen, and M. Drews, 2016: A Source Term Estimation Method for a Nuclear Accident, using Atmospheric Dispersion Models., *Int. J. Environ. Pollut,* **Vol. 58***,* Nos. 1/2, pp 39-51.

Steinhoff, D.F., A.J. Monaghan, L. Eisen, M.J. Barlage, T.M. Hopson, I. Tarakidzwa, K. Ortiz-Rosario, S. Lozano-Fuentes, M.H. Hayden, **P.E. Bieringer**, C. Welsh-Rodgriguez, 2016: A Weather-Driven Energy Balance Model for Determining Water Height and Temperature in Container Habitats for Aedes aegypti. *Earth Interact.,* **20,** No 24, pp. 1-31.

Meir, T., J. Pullen, A.F. Blumberg, T.R. Holt, **P.E. Bieringer,** and G. Bieberbach, Jr., 2017: Simulation of Airborne Transport and Dispersion for Urban Waterside Releases. *J. Appl. Meteor. Climatol.,* **56,** Vol 1, pp. 27-44. DOI: http://dx.doi.org/10.1175/JAMC-D-16-0025.1.

Bieringer, P.E., G.S. Young, L.M. Rodriguez, A.J. Annunzio, F. Vandenberghe, S.E. Haupt, 2017: Paradigms and Commonalities in Atmospheric Source Term Estimation., *Atmos. Environ.* **156,** pp. 102-112. http://dx.doi.org/10.1016/j.atmosenv.2017.02.011

Refereed Journal Papers Currently In Process

Annunzio, A.J., **P.E. Bieringer**, J. Hannan, R. Cabell, G. Bieberbach: A Methodology for Sensor Testing and Evaluation for Defense Applications, *Submited for publication in Journal of Applied Meteorology and Climatology.*

Bieberbach, G., **P.E. Bieringer**, and S. Longmore: An Analysis of Climatological Dispersion Patterns for the National Bio and Agro-Defense Facility (NBAF) Risk Assessment. *In preparation for submission to Bulletin of the American Meteorological Society.*

Bieringer, P.E. and G. Bieberbach: An Assessment of Pathogen Release Risk Due to a Tornado Strike on the National Bio and Agro-Defense Facility (NBAF). *In preparation for submission to Journal of Applied Meteorology and Climatology.*

Technical Reports

Lawrence, W.G., E.C. Wack, D.C. Jamrog, J.C. Biddle, H.W. Lau, S.E. Holster, C.J. Smith, A.K. Goyal, F.D. D'Arcangelo, A.J. Annunzio, **P.E. Bieringer**, R. Cabell, and G. Bieberbach, 2013: Scientific evaluation of technology for standoff detection of chemical and biological agents., *MITLL Project Report No. CB-3*, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA.

Bieberbach, G**.**, **P.E. Bieringer,** S. Longmore, J. Copeland, and D. Rife, 2012: Aerosol Fate and Transport (Plume) Modeling. *Volume I, National Bio and Agro-Defense Facility Updated Site-Specific Biosafety and Biosecurity Mitigation Risk Assessment*, Department of Homeland Security, Science and Technology Directorate, 237-322.

Bieringer, P.E. and G. Bieberbach, 2012: Appendix A5: NBAF Updated SSRA Tornado Hazard Analysis. *Appendices, National Bio and Agro-Defense Facility Updated Site-Specific Biosafety and Biosecurity Mitigation Risk Assessment*, Department of Homeland Security, Science and Technology Directorate, A5-1 - A5-18.

Bieberbach, G, **P.E. Bieringer,** S. Longmore, J. Copeland, and D. Rife, 2010: Appendix J: Aerosol Fate and Transport (Plume) Modeling. *Appendices to Final Report, National Bio and Agro-Defense Facility Site-Specific Biosafety and Biosecurity Mitigation Risk Assessment*, Department of Homeland Security, Science and Technology Directorate, J1-J71.

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Bieringer, P.E., M.E. Weber, J.I. Ferris, and S.W. Troxel, 2002: ASR-11 Weather Channel Analysis Results. *MITLL Wx Project Memorandum* No. 43PM Wx-0084, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA.

Bieringer, P.E., 2001: Weather Analysis for the April 12, 2001 ASR-11 Plot Amplitude Thresholding Event. *MITLL Wx Project Memorandum* No. 95PM Wx-0079, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA.

Troxel, S.W. **P.E. Bieringer**, J.I. Ferris, M.E. Weber, J.R. Eggert, 2000: Results of the ASR-11 Weather Channel Field Test at Eglin AFB, Florida, *MITLL Wx Project Memorandum* No. 95PM Wx-0067, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA.

Bieringer, P.E., 2000: ASR-11 Weather Channel P^3I Algorithm Analysis. *MITLL Wx Project Memorandum* No. 95PM Wx-0066, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA.

Troxel, S.W., **P.E. Bieringer**, M.E. Weber, G.W. Rappa, 1999: Field Testing of the Digital Airport Surveillance Radar (DASR) Weather Radar. *MITLL Wx Project Memorandum* No. 43PM Wx-0057, Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA.

Conference Papers

Urban, J.T., K. Galvin, N. Platt, **P.E. Bieringer**, G. Bieberbach, and A. Annunzio, 2013: Comparison Of Hazard Area And Casualty Predictions Of A Small-Scale Chemical Attack Using Various Toxic Load Toxicity Models. *15th International Conference on Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes.,* 6-9, May, Madrid, Spain.

Christopher C., N. Platt, J. Urban, **P.E. Bieringer,** G. Bieberbach, A. Wyszogrodzki and J. Weil, 2013: A Comparison Of Hazard Area Predictions Based On The Ensemble-Mean Plume Versus Individual Plume Realizations Using Different Toxic Load Models. *91st Annual American Meteorological Society Meeting*. Jan 6-11, 2013, Austin TX.

Hamilton, A., S. Szmania, D. Kadavy, M. Isbell, M. Gardner, R. Cassagrande, G. Bieberbach, **P.E. Bieringer,** M. Kazmierczak, M. Rush, K. Coble, T. Marsh, D. Pendell, F. Bryant, P. Splichal, and J. Brewer, 2012: Site-Specific Biosafety And Biosecurity Risk Assessment For The National Bio And Agro-Defense Facility. *International Society of Veterinary Epidemiology and Economics*, August 20-24, 2012 Maastricht, Netherlands.

Bieringer, P.E., J. Hannan, S. Longmore, G. Bieberbach, T. Warner, 2011: A Method for Targeting Chemical Samplers for Facility Monitoring in an Urban Environment. *14th International Conference on Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes.,* 2-6, October, Kos, Greece.

Vandenberghe, F., **P.E. Bieringer**, I. Sykes, J. Hannan, J. Hurst, G. Bieberbach, S. Parker, and L. Rodriguez, 2011: Automated Source Parameter and Low Level Wind Estimation for Atmospheric Transport and Dispersion Applications. *14th International Conference on Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes.,* 2-6, October, Kos, Greece.

Platt, N., C. Czech, J. Urban, D. DeRiggi, M. Ambroso, **P.E. Bieringer**, G. Bieberbach, A. Wyszogrodzki, and J. Weil, 2011: Use of The Ensemble-Mean Plume versus Individual Plume Realizations for Toxic Load Modeling. *Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes.,* 2-6, October, Kos, Greece.

Czech, C., N. Platt, J. Urban, **P.E. Bieringer**, G. Bieberbach, A. Wyszogrodzki and J. Weil, 2011: A comparison of hazard area predictions based on the ensemble-mean plume versus individual plume realizations using different toxic load models, *Paper 2.5 at the Special Symposium on Applications of Air Pollution Meteorology,* 91st Annual American Meteorological Society Meeting, Seattle, Washington, January 2011.

Bieringer, P. E., L. M. Rodriguez, I. Sykes, J. Hurst, F. Vandenberghe, J. Weil, G. Bieberbach Jr., S. Parker, R. Cabell, 2011: Fusion of chemical, biological, and meteorological observations for agent source term estimation and hazard refinement. Proceedings, *Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2011* Orlando, FL, International Society for Optics and Photonics (SPIE), Proceedings Vol **8064**. [Available online at http://spie.org/x648.html?product_id=884221].

Curriculum Vitae
Paul E. Bieringer, Ph.D

Bieringer, P.E., I. Sykes, F. Vandenberghe, J. Hurst, J. Weil, G. Bieberbach, S. Parker, R. Cabell, 2010: Automated source parameter estimation for atmospheric transport and dispersion applications. *13th International Conference on Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes.,* 1-4, June, Paris, France.

Bieberbach, G. **P.E. Bieringer**, R. Cabell, J. Hurst, J. Weil, A. Wyszogrodzki, and J. Hannan, 2010: A Framework for Developing Synthetic Chemical and Biological Agent Release Data Sets. *13th International Conference on Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes.,* 1-4, June, Paris, France.

Bieberbach, G., **P.E. Bieringer**, A. Wyszogrodzki, J. Weil, R. Cabell, J. Hurst, and J. Hannan, 2010: Virtual chemical and biological (CB) agent data set generation to support the evaluation of CB contamination avoidance systems. *The Fifth International Symposium on Computational Wind Engineering (CWE2010),* 23-27, May, Chapel Hill, NC.

Bieringer, P.E., J. Weil, J. Hurst, G. Bieberbach, A. Wyszogrodzki, R. Sheu, M. Raines, and T. Warner, 2008: A Framework for Developing Synthetic Chemical and Biological Agent Release Data Sets for use in Virtual Test and Evaluation. *Chemical and Biological Defense Physical Science and Technology Conference*, 17-21, Nov., New Orleans, LA.

Bieringer, P. E., F. Vandenberghe, J. Hurst, and J. Weil, 2008 Variational Assimilation of Chemical, Biological, and Meteorological Observations for Source Term Estimation and Hazard Refinement., *Chemical and Biological Defense Physical Science and Technology Conference*, 17-21, Nov., 2008, New Orleans, LA.

Bieringer, P.E., M. Donovan, F. Robasky, D. Clark, and J. Hurst, 2006: A Characterization of NWP Ceiling and Visibility Forecasts for the Terminal Airspace. *Preprints, 12th Conference on Aviation, Range, and Aerospace Meteorology.* 29 January – 2 February, Atlanta, GA, American Meteorological Society, Boston, MA.

Bieringer, P.E., Y. Xie, B. Martin, J. Morgan, S. Winkler, J. Hurst, J. McGinley, and S. Abers, 2006: An Assessment of Automated Boundary and Front Detection to Support Convective Initiation Forecasts. *Preprints, 12th Conference on Aviation, Range, and Aerospace Meteorology.* 29 January – 2 February, Atlanta, GA, American Meteorological Society, Boston, MA.

Dupree, W.J., M. Robinson, R. DeLaura, **P.E. Bieringer**, 2006: Echo Tops Forecast Generation and Evaluation of Air Traffic Flow Management Needs in the National Airspace System. *Preprints, 12th Conference on Aviation, Range, and Aerospace Meteorology.* 29 January – 2 February, Atlanta, GA, American Meteorological Society, Boston, MA.

J. Hurst, **P.E. Bieringer**, A. Lewis, D. Jeannote, and E. Griffin, 2005: Optimizing MM5 On An Intel Based LINUX BEOWULF Cluster. *Preprints, 6th WRF/15th MM5 Users' Workshop,* 27-30 June, Boulder, CO, National Center for Atmospheric Research.

Wolfson. M., W. Dupree, R. Boldi, C. Wilson, K. Calden, R. Johnson, **P.E. Bieringer**, 2005: Tactical 0-2 Hour Convective Weather Forecasts For FAA. *Preprints, World Weather Research Program Symposium on Nowcasting and Very Short Range Forecasting.* 5 – 9 September, 2005, Toulouse, France.

Bieringer, P.E., B. Martin, B. Collins, and J. Shaw, 2004: Commercial Aviation Encounters with Severe Low Altitude Turbulence. *Preprints, 11th Conference on Aviation, Range, and Aerospace Meteorology.* 4 – 8 October, Hyannis, MA, American Meteorological Society, Boston, MA.

Wolfson, M.M., B. E. Forman, K. T. Calden, R. A. Boldi, W. J. Dupree, R. J. Johnson, C. Wilson, **P.E. Bieringer**, E. B. Mann, and J. P. Morgan, 2004: Tactical 0 – 2 Hour Convective Weather Forecasts for FAA. *Preprints, 11th Conference on Aviation, Range, and Aerospace Meteorology.* 4 – 8 October, Hyannis, MA, American Meteorological Society, Boston, MA.

Bieringer, P.E 2003: The Effect of Topography on Initial condition Sensitivity of a Mesoscale Model. *Preprints, 10th Conference on Mesoscale Processes.* 23 – 27 June, Portland, OR, American Meteorological Society, Boston, MA.

Bieringer, P.E., 2003: Utilizing Local Terrain to Determine Targeted Weather Observation Locations. *Proceedings: 2003 Battlespace Atmospheric and Cloud Impacts on Military Operations.* 9 – 11 September, Naval Research Laboratory, Monterey, CA.

Curriculum Vitae
Paul E. Bieringer, Ph.D

Bieringer, P.E. 2002: Low Altitude Buoyancy Wave Turbulence – A Potential Aviation Safety Threat. *Preprints, 10th Conference on Aviation, Range, and Aerospace Meteorology*. 13 – 16 May, Portland, OR, American Meteorological Society, Boston, MA.

Bieringer, P.E., J. Ferris, and M.E. Weber, 2001: General Purpose Weather Surveillance with the Airport Surveillance Radar 11 (ASR-11). *Preprints, 30th International Conference on Radar Meteorology*. 18-24 July, Munich, Germany, American Meteorological Society, Boston, MA

Bieringer, P.E., M.E. Weber, S. Troxel, N.I. Sapankevych, T.M. Scheve, and R.C. Evett, 2000: Ground Clutter Rejection in the Weather Channel of the Next Generation Airport Surveillance Radar (ASR-11). *Preprints, 29th International Conference on Radar Meteorology*, 12-16 July, Montreal, Quebec, Canada, American Meteorological Society, Boston, MA, 568-571.

Bieringer P.E., D.W. Miller, and D. Meyer, 1999: A Refinement of Thunderstorm Climatology for the Terminal Radar Control Airspace. *Preprints, 8th Conference on Aviation, Range, and Aerospace Meteorology*, 10-15 January, Dallas, TX, American Meteorological Society, Boston, MA, 281-284.

Bieringer, P.E., and P.S. Ray, 1997: Localized Thermodynamic Stability as a Precursor to Thunderstorm Propagation, Growth and Decay. *Preprints, 28th Conference on Radar Meteorology*, 7-12 September, Austin, TX, American Meteorological Society, Boston, MA, 530-531.

Bieringer, P.E., P.S. Ray, X. Niu, and B. Whissel, 1996: An Improved Estimate of Tornado Occurrence in the United States. *Preprints, 18th Conference on Severe Local Storms*, 19-23 February, San Francisco, CA, American Meteorological Society. Boston, MA, 631-635.

Bieringer, P.E., and P.S. Ray, 1995: Tornado Warning Lead Times with and without NEXRAD Doppler Radar. *Preprints, 27th Conference on Radar Meteorology*, 9-13 Oct 1995, Vail, CO, American Meteorological Society, Boston MA, 202-204.