

Jonathan G. Hurst

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Education	University of Colorado at Boulder (July 2007 – July 2010) Master's of Science in Computer Science Thesis title: Parallelizing a Data Intensive Lagrangian Stochastic Particle Model using Graphics Processing Units
	Worcester Polytechnic Institute (August 2001 – May 2005) Bachelor of Science in Computer Science

Experience	Aeris LLC Boulder, CO (May 2015 – present) Managing Partner, Principal Engineer <u>Joint Effects Model (JEM) Increment 2:</u> <ul style="list-style-type: none">• Implemented source term estimation (STE) algorithm from HPAC into JEM2.• Supported the integration of VLSTRACK's secondary evaporation capability into JEM2.• Maintained and prepared SCIPUFF, SWM and other components for verification and validation (V&V) analysis in support of JEM2 fielding decisions.
	National Center for Atmospheric Research (NCAR) & STAR LLC Boulder, CO (July 2007 – May 2015) Software Engineer II <u>Joint Effects Model (JEM) Increment 2:</u> <ul style="list-style-type: none">• Led the successful effort to decouple the SCIPUFF transport and dispersion model from its weather processing engine known as SWIM.• Responsible for changes to the met processor and spatial domain Common CBRN Model Interface (CCMI) blueprint schemas and the development of the new met mass consistency model schema.• Primary developer responsible for developing and maintaining the following components: td-scipuff, metp-swim, metmc-swift, tdc-tdcontroller among others. <u>Weather Research Forecast Model (WRF) Management System (WRFMS):</u> <ul style="list-style-type: none">• Designed and implemented the Java based WRFMS to consolidate the preparation, execution of post processing of WRF simulations.• Model executions launched through Torque Resource Manager.• Many input model datasets supported such as NNRP, CFRS, GFT, GLDAS, SST and observations.• Automatic post processing of WRF results for file conversion and self organizing map (SOM) calculation.• The WRFMS is now across multiple programs and companies due to its convenience. <u>Source Term Estimation (STE):</u> <ul style="list-style-type: none">• Designed a Python scripting package to connect disparate MATLAB and Fortran software into a rapid prototype STE algorithm.• Lead the engineering effort to implement a production quality Java STE implementation using modern build tools (maven), unit testing and thorough javadoc documentation.• Created an analysis infrastructure (written in MATLAB) to analyze and understand the STE algorithm and generate publication quality graphics.• Integrated Java STE implementation into the Hazard Prediction and Assessment Capability (HPAC) in 2011 and the Joint Effects Model (JEM) via the Common CBRN Model Interface (CCMI) in 2012.• Advised Joint Program Management Information Systems (JPM IS) in incorporating source term estimation and hazard observation concepts into the JEM CCMI. <u>Contamination Avoidance System Performance Model (CA-SPM):</u> <ul style="list-style-type: none">• Implemented an OSGi backbone (using maven and declarative services) for a robust and dynamic Java based CA-SPM.• Designed backend infrastructure enabling detailed sensor simulation via discrete event simulation.• Focused on loosely coupled OSGi bundle design with high intra-bundle cohesion and clean, simple extra-bundle interfaces. <u>Lagrangian Particle Dispersion Model (LPDM) Enhancements:</u> <ul style="list-style-type: none">• Parallelized a Large Eddy Simulation dependant LPDM (written in Fortran) using OpenMP and MPI technologies.

- Converted the Fortran LPDM to C/C++ for use with NVIDIA GPU hardware through CUDA, achieving a 20x speedup over the sequential baseline implementation.
- Performed a detailed performance analysis of the various LPDM implementations using gprof, MPE directives and the Intel Pin Tool for dynamic binary instrumentation. (see publication)

MIT Lincoln Laboratory

Lexington, MA

(May 2005– July 2007)

Group 43: Convective Weather Software Engineer

- Assisted in the prototyping and development of unprecedented atmospheric frontal boundary detection software leveraging MATLAB's C/C++ compiler technology. (see publication)
- Designed conversion software to ingest and decode weather data from external laboratories in support internal algorithm development.
- Implemented objective analysis software to incorporate rapid updating surface point observations into two dimensional analysis grids utilized by the group's internal algorithms.

MIT Lincoln Laboratory

Lexington, MA

(May 2004 – May 2005)

Group 43: Convective Weather Software Engineer (Intern)

- Architected operational software to automate the operations of a weather forecast model on a Linux Beowulf Cluster equipped with low latency Infiniband interconnects.
- Converted weather data between multiple documented formats.

Publications

Hurst, Jonathan G.: "Parallelizing a Data Intensive Lagrangian Stochastic Particle Model Using Graphics Processing Units", M.S. Thesis, University of Colorado Boulder, Department of Computer Science, 2010. <http://pqdtopen.proquest.com/#viewpdf?dispub=1481219>

Conference Papers

- Vandenbergh, 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.
- Bieringer, P.E., L.M. Rodriguez, I. Sykes, J. Hurst, F. Vandenbergh, J. Weil, G. Bieberbach, S. Parker, R. Cabell, 2011: Fusion of Chemical, Biological, and Meteorological Observations for Agent Source Term Estimation and Hazard Refinement., 28 April, Orlando, Florida.
- Bieringer, P.E., I. Sykes, F. Vandenbergh, 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: *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. Vandenbergh, 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., Morgan, J., Hurst, J., Martin, B., Winkler, S., Xie, Y., McGinley, J. and Albers, S.: "An Assessment of Automated Boundary and Front Detection to Support Convective Initiation Forecasts", 12th Conference on Aviation Range and Aerospace Meteorology, MIT Lincoln Laboratory, February, 2006.
- Hurst, J., Bieringer, P., Lewis, A., Jeannotte, D. and Griffin, E.: "Optimizing MM5 on an Intel Based Linux Beowulf Cluster", 6th WRF / 15th MM5 Users' Workshop, MIT Lincoln Laboratory, June, 2005.
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