Jonathan Poterjoy *Curriculum Vitae*

CIMMS, NOAA NSSL, and OU
National Weather Center, Suite 210
120 David L. Boren Blvd.
Norman, OK 73072

Telephone: (814) 769-3494
E-mail: jonathan.poterjoy@noaa.gov

EDUCATION

Ph.D. in Meteorology, August 2014
The Pennsylvania State University, University Park, PA
Advisor: Professor Fuqing Zhang
Thesis: *Ensemble and Hybrid Four-Dimensional Data Assimilation for Tropical Cyclone Analysis and Prediction.*

B.S. in Meteorology and Applied Mathematics, May 2009 (Magna Cum Laude)
Millersville University of Pennsylvania, Millersville, PA

RESEARCH INTERESTS

Data assimilation, Bayesian methods, atmospheric dynamics, ensemble forecasting, tropical cyclones, and mesoscale meteorology

PROFESSIONAL EXPERIENCE

Cooperative Institute for Mesoscale Meteorological Studies, **NOAA National Severe Storms Laboratory, and the University of Oklahoma,** Norman, OK
Postdoctoral Research Associate, August 2016 – present
- Postdoctoral researcher funded under the NOAA Warn-on-Forecast Program
- Short-term collaboration with NOAA NSSL and OU/CIMMS to implement a non-Gaussian data assimilation system for convective-scale weather analysis and forecasting

National Center for Atmospheric Research, Boulder, CO
Postdoctoral Fellow, August 2014 – August 2016
- Postdoctoral researcher in the NCAR Advanced Study Program
- Worked jointly between the Institute for Mathematics Applied to Geosciences and the Mesoscale and Microscale Meteorology Laboratory

The Pennsylvania State University, University Park, PA
Research Assistant, May 2009 – August 2014
- Graduate researcher/lecturer in the Pennsylvania State University graduate program
- Advised by Dr. Fuqing Zhang, professor of meteorology and statistics

National Center for Atmospheric Research, Boulder, CO
Graduate Student Visitor, February 2012 – April 2012
- NCAR-ASP student visitor under the advisement of Dr. Xiang-Yu Huang in the Mesoscale and Microscale Meteorology Division

- Aided in the development and testing of a multi-incremental 4DVar scheme for the WRF variational data assimilation system

National Weather Center Research Experience for Undergraduates (REU), Norman, OK
Research Intern, May 2008 – August 2008

- Full-time summer internship through the University of Oklahoma, NSF-funded REU program
- Completed a research project using a local ensemble transform Kalman filter to assimilate observations in the Estuarine and Coastal Ocean Model

REFEREED JOURNAL PUBLICATIONS

Poterjoy, J., R. A. Sobash, and J. L. Anderson, 2017: Convective-scale data assimilation for the Weather Research and Forecasting model using the local particle filter., accepted.

Poterjoy, J., and J. L. Anderson, 2016: Efficient assimilation of simulated observations in a high-dimensional geophysical system using a localized particle filter. *Mon. Wea. Rev*., **144**, 2007 – 2020.

Poterjoy, J. and F. Zhang, 2016: Comparison of hybrid four-dimensional data assimilation methods with and without the tangent linear and adjoint models for predicting the life cycle of Hurricane Karl (2010). *Mon. Wea. Rev*. **144**, 1449 – 1468.

Poterjoy, J., 2016: A localized particle filter for high-dimensional nonlinear systems. *Mon. Wea. Rev.*, **144**, 59 – 76.

Poterjoy, J. and F. Zhang, 2015: Systematic comparison of four-dimensional data assimilation methods with and without a tangent linear model using hybrid background error covariance: E4DVar versus 4DEnVar. *Mon. Wea. Rev.*, **143**, 1601 – 1621.

Poterjoy, J. and F. Zhang, 2014: Inter-comparison and coupling of ensemble and four-dimensional variational data assimilation methods for the analysis and forecasting of Hurricane Karl (2010). *Mon. Wea. Rev.*, **142**, 3347 – 3364.

Poterjoy, J. and F. Zhang, 2014: Predictability and genesis of Hurricane Karl (2010) examined through the EnKF assimilation of field observations collected during PREDICT. *J. Atmos. Sci.*, **71**, 1260 – 1275.

Poterjoy, J., F. Zhang, and Y. Weng, 2014: The effects of sampling errors on the EnKF assimilation of inner-core hurricane observations. *Mon. Wea. Rev*., **142**, 1609 – 1630.

Zhang, X., X.-Y. Huang, L. Yianyu, **J. Poterjoy**, Y. Weng, F. Zhang, and H. Wang, 2014: Development of an efficient regional four-dimensional variational data assimilation system for WRF. *J. Atmos. Oceanic Technol.*, **31**, 2777 – 2794.

Zhang, F., M. Zhang, and **J. Poterjoy**, 2013: E3DVar: Coupling an ensemble Kalman filter with three-dimensional variational data assimilation in a limited-area weather prediction model and comparison to E4DVar. *Mon. Wea. Rev.*, **140**, 900 – 917.

Xie, B., F. Zhang, Q. Zhang, **J. Poterjoy**, and Y. Weng, 2013: Observing strategy and observation targeting for tropical cyclones using ensemble-based sensitivity analysis and data assimilation. *Mon. Wea. Rev.*, **141**, 1437 – 1453.

Poterjoy, J. and F. Zhang, 2011: Dynamics and structure of forecast error covariance in the core of a developing hurricane. *J. Atmos. Sci.*, **68**, 1586 – 1606.

PUBLICATIONS SUBMITTED, IN REVISION, AND IN PROGRESS

Poterjoy, J., and M. Buehner, 2017: Progress in the development of a localized particle filter for data assimilation in high-dimensional geophysical systems., in progress.

Poterjoy, J., L. J. Wicker, K. H. Knopfmeier, and D. M. Wheatley, 2017: Initial tests of a non-Gaussian data assimilation method for the NSSL Experimental Warn-on-Forecast System., in progress.

Morzfeld, M., D. Hodyss, **J. Poterjoy**, 2017: Localized particle filters for sparse data assimilation problems. Part I: stochastic models, in progress.

Morzfeld, M., D. Hodyss, **J. Poterjoy,** 2017: Localized particle filters for sparse data assimilation problems. Part II: deterministic models, in progress

INVITED LECTURES

- Storm-Scale Weather Analysis and Prediction at the NOAA National Severe Storms Laboratory Using a Non-Gaussian Filter, 3rd *RIKEN International Symposium on Data Assimilation,* Kobe, Japan, 2017
- Probabilistic Weather Analysis and Prediction Using the Local Particle Filter, *Advances in Data Assimilation, Predictability, and Uncertainty Quantification, American Geophysical Union Fall Meeting,* San Francisco, CA, 2016
- Storm-Scale Weather Analysis and Prediction Using a Nonparametric Filter, *University of Arizona, Department of Mathematics Seminar,* Tucson, AZ, 2016
- Progress Toward the Development of a Nonlinear Filter for High-Dimensional Data Assimilation in Geoscience, *Penn State Center for Advanced Data Assimilation and Predictability Techniques Seminar*, University Park, PA, 2016
- Hybrid and Coupling of Ensemble and Variational Data Assimilation: An Informative Comparison of Adjoint- and Ensemble-Based Four-Dimensional Strategies, *Penn State Center for Advanced Data Assimilation and Predictability Techniques Seminar*, University Park, PA, 2016
- Probabilistic Storm-Scale Analysis and Prediction Using a Nonparametric Ensemble Filter: Implications for Tropical Cyclone Forecasting, *NOAA Hurricane Research Division Seminar,* Miami, FL, 2016
- Efficient Assimilation of Observations via a Localized Particle Filter in High-Dimensional Geophysical Systems, *Perspectives on Model-informed Data Assimilation, SIAM Conference on Uncertainty Quantification*, Lausanne, Switzerland, 2016.
- An Efficient Nonparametric Data Assimilation Method for Atmospheric Research and Ensemble Forecasting. *National Weather Center Seminar*, Norman, OK, 2016
- Efficient Nonparametric Data Assimilation for Atmospheric Research and Prediction. *Florida State University, Department of Earth, Ocean and Atmospheric Science Seminar,* Tallahassee, FL, 2016
- A Localized Particle Filter for Data Assimilation in High-dimensional Nonlinear Systems. *STATMOS Summer School in Data Assimilation,* Boulder, CO, 2015
- Hybrid and Coupling of Ensemble and Variational Data Assimilation. 12th *CAS-TWAS-WMO Forum: Data Assimilation Summer School*, Beijing, China, 2015
- Introduction to NCAR Data Assimilation Research Testbed (DART). 12th *CAS-TWAS-WMO Forum: Data Assimilation Summer School*, Beijing, China, 2015
- A Localized Particle Filter for Large Dimensional State Estimation. 12th *CAS-TWAS-WMO Forum: Coupled Data Assimilation Symposium,* Beijing, China, 2015
- Can We do Better Than the Kalman Filter? A Localized Particle Filter for Large Dimensional State Estimation. *Peking University Department of Atmospheric and Oceanic Sciences*, Beijing, China, 2015
- A Localized Particle Filter for Large Dimensional State Estimation. *Chinese Academy of Meteorological Sciences,* Beijing, China*,* 2015
- A Localized Particle Filter for High-dimensional Nonlinear Systems. *Cooperative Institute for Research in the Atmosphere*, Fort Collins, CO, 2015
- Ensemble Filtering for Large-Dimensional Nonlinear Systems. *Penn State University Department of Statistics Seminar,* University Park, PA, 2014
- Hybrid Four-Dimensional Data Assimilation With and Without Tangent Linear Model Operators. *6th EnKF Workshop,* Buffalo, NY, 2014
- Hybrid Data Assimilation for Tropical Cyclone Analysis and Prediction. *Stony Brook University Department of Marine and Atmospheric Sciences Seminar,* Stony Brook, NY, 2014.

OTHER CONFERENCE AND WORKSHOP PRESENTATIONS

- **Poterjoy, J**, L. J. Wicker, R. Sobash, and J. Anderson 2016: Probabilistic Analysis and Prediction of Convective Storms using the Local Particle Filter, *Severe Local Storms Conference*, Portland, OR.
- **Poterjoy, J**, R. Sobash, and J. Anderson 2016: Convective-scale data assimilation in the Weather Research and Forecasting model using a nonlinear ensemble filter. *7th EnKF Workshop*, University Park, PA.
- **Poterjoy, J**, R. Sobash, and J. Anderson 2016: Convective-scale data assimilation in the Weather Research and Forecasting model using a nonlinear ensemble filter. *Numerical weather prediction, data assimilation and ensemble forecasting, EGU General Assembly.* Vienna, Austria.
- **Poterjoy, J**, R. and J. Anderson 2016: A localized particle filter for data assimilation in high-dimensional geophysical models. *Inverse Problems, Data Assimilation, Initial and Model Errors.* Vienna, Austria.
- **Poterjoy, J**, R. Sobash, and J. Anderson 2016: Development and testing of an efficient non-Gaussian ensemble filter for data assimilation in geoscience. *20th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface.* New Orleans, LA.
- **Poterjoy, J**, and F. Zhang, 2015: Systematic comparison of four-dimensional data assimilation methods with and without the tangent linear model using hybrid background error covariance: E4DVar versus 4DEnVar. *Eugenia Kalnay Symposium.* Phoenix, AZ.
- **Poterjoy, J**, and F. Zhang, 2015: Tangent-linear and ensemble-based four-dimensional data assimilation strategies applied for assimilating conventional data and field observations for Hurricane Karl (2010), 19th *Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface*. Phoenix, AZ.
- **Poterjoy, J**, and F. Zhang, 2014: Tangent-linear and ensemble based four-dimensional data assimilation strategies applied for assimilating conventional data and field observations for Hurricane Karl (2010): *Tropical Cyclones: Observations, Modeling, and Predictability III, American Geophysical Union Fall Meeting*, San Francisco, CA.
- **Poterjoy, J**, and F. Zhang, 2014: Ensemble filtering and forecasting for nonlinear large-dimensional systems: *Non-Gaussian and Nonlinear Techniques for Data Assimilation/Fusion, Predictability, and Uncertainty Quantification II, American Geophysical Union Fall Meeting*, San Francisco, CA.
- **Poterjoy, J**, and F. Zhang, 2014: The genesis of Hurricane Karl (2010) examined through cycling ensemble data assimilation experiments using PREDICT observations. *18th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface.* Atlanta, GA.
- **Poterjoy, J**, and F. Zhang, 2014: Inter-comparison and coupling of ensemble and variational data assimilation approaches for mesoscale modeling. *26th Conference on Weather Analysis and Forecasting / 22nd Conference on Numerical Weather Prediction*. Atlanta, GA.
- **Poterjoy, J.**, F. Zhang, and M. Zhang, 2013: Inter-comparison and coupling of ensemble and variational data assimilation approaches for regional-scale modeling. *6th WMO Symposium on Data Assimilation*, College Park, MD.
- **Poterjoy, J.** and F. Zhang, 2013: The predictability of tropical cyclogenesis examined through ensemble data assimilation experiments for Hurricane Karl (2010). *15th Conference on Mesoscale Processes*, Portland, OR.
- **Poterjoy, J**. and F. Zhang, 2012: Coupling EnKF and variational data assimilation methods for predicting the genesis of Hurricane Karl (2010), *American Geophysical Union Fall Meeting*, San Francisco, CA.
- **Poterjoy, J**., F. Zhang, X. Zhan, and X.-Y. Huang, 2012: Coupling EnKF with 4DVar for mesoscale data assimilation. *5th Ensemble Data Assimilation Workshop*, Rensselaerville, NY.
- **Poterjoy, J**. and F. Zhang, 2011: Dynamics and predictability of tropical cyclogenesis during PREDICT revealed from ensemble analyses and forecasts with coupled variational-EnKF data assimilation systems. *14th Conference on Mesoscale Processes*, Los Angeles, CA.
- **Poterjoy, J**. and F. Zhang, 2010: Dynamics and structure of forecast error covariance in the inner core of a developing hurricane. *29th Conference on Hurricanes and Tropical Meteorology*, Tucson, AZ.

- **Poterjoy, J**. and F. Zhang, 2010: The importance of error covariance in the core region of a hurricane for dynamically consistent vortex initialization: Can background error be approximated using an axisymmetric model? *4th Ensemble Data Assimilation Workshop*, Rensselaerville, NY.
- **Poterjoy, J**. and F. Zhang, 2010: Dynamics and structure of three-dimensional error covariance of a mature hurricane. *14th Symposium on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface*. Atlanta, GA.
- **Poterjoy, J**., R. N. Hoffman, and S. M. Leidner, 2009: Estimating correlations from a coastal ocean model for localizing an Ensemble Transform Kalman filter. *8th Annual AMS Student Conference*, Phoenix, AZ.

UNIVERSITY TEACHING EXPERIENCE

Co-Lecturer, Pennsylvania State University, METEO 597B, *Data Assimilation*, Spring 2013
- Lecture topics: optimal interpolation, EnKF, 3DVar, 4DVar, adjoint sensitivity analysis, ensemble sensitivity analysis, observation impact, parameter estimation, and hybrid data assimilation
- Additional tasks: assisted in the development of the course curriculum, and constructed and graded programming lab assignments

Guest Lecturer, University of Oklahoma, METR 6313, *Advanced Topics in Data Assimilation*, Spring 2017
- Lecture topic: Introduction to Particle Filters

Guest Lecturer, Pennsylvania State University, METEO 526, *Numerical Weather Prediction*, Spring 2011
- Lecture topic: EnKF and Lorenz (1963) model tutorials

Teaching Assistant, Pennsylvania State University, METEO 474, *Computer Methods in Meteorological Analysis and Forecasting*, Spring 2011
- Lab assistant for an undergraduate data mining course
- Tasks: graded labs, answered questions from students, and organized a capstone project

HONORS AND AWARDS

- National Research Council Postdoctoral Fellowship, NOAA Atlantic Oceanographic and Meteorological Laboratory, 2017 – 2019
- Advanced Study Program Postdoctoral Fellowship, National Center for Atmospheric Research, 2014 – 2016
- Best student presentation award, *18th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface*, Atlanta, GA, 2014
- Best student presentation award, *15th Conference on Mesoscale Processes*, Portland, OR, 2013
- Student travel award, *18th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface*, Atlanta, GA, 2014
- Student travel award, *15th Conference on Mesoscale Processes*, Portland, OR, 2013
- National Science Foundation Graduate Research Fellowship Program honorable mention award, 2010 and 2011

PROFESSIONAL ACTIVITIES

- Associate editor of Monthly Weather Review
- Reviewer for several scientific journals, including Monthly Weather Review, Journal of Atmospheric Science, Journal of Applied Meteorology and Climatology, Weather and Forecasting, Quarterly Journal of the Royal Meteorological Society, Physica D: Nonlinear Phenomenon, Tellus A: Dynamic Meteorology and Oceanography, Journal of Climate, Atmospheric Research, and Ocean Dynamics.
- Organizing committee member, *7th EnKF Workshop*, University Park, PA, 2016
- Summer School Lecturer, *CAS-TWAS-WMO Data Assimilation Summer School*, Beijing, China, 2015
- Summer School Lecturer, *STATMOS Summer School in Data Assimilation,* Boulder, CO, 2015
- Co-author, *Eighth International Workshop on Tropical Cyclones: Subtopic 4.3 – structure change forecasting*, 2014
- Invited participant, *NSF "Big Weather" workshop*, Boulder, CO, 2014
- Invited participant, *NSF EarthCube workshop*, Boulder, CO, 2012
- Student participant, *Advanced Mathematical Methods to Study Atmospheric Dynamical Processes and Predictability workshop in Banff*, Canada, 2011
- Internal reviewer for several papers and grant applications at Penn State and NCAR
- Primary developer of the local Particle Filter, a nonlinear data assimilation technique available freely through the open source NCAR Data Assimilation Research Testbed (DART) software package
- Helped develop and maintain the Pennsylvania State University WRF-EnKF data assimilation system and its hybrid with WRF-3DVar, -4DVar, and 4D-ensemble-Var