Curriculum Vitae

MICHAEL E. BALDWIN

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Education

2003 Ph.D., Meteorology, University of Oklahoma, Norman, Oklahoma
Dissertation: *Automated Classification of Rainfall Systems Using Statistical Characterization*
Committee chair: Prof. Frederick H. Carr
Principal advisor: Prof. S. Lakshmivarahan

1991 M.S., Meteorology, University of Oklahoma, Norman, Oklahoma
Thesis: *Incorporation of Precipitation Data into a Numerical Weather Prediction Data Assimilation System.* Advisor: Prof. Frederick H. Carr

1988 B.S.E., Atmospheric Science, University of Michigan, Ann Arbor, Michigan

Appointments

2006-present Assistant Professor, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana

1999-2006 Research Scientist, Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, Oklahoma

1991-1999 Support Scientist, General Sciences Corporation, National Centers for Environmental Prediction/Environmental Modeling Center, Camp Springs, Maryland

Teaching Experience

2009 Fall: Purdue University, Team Weather Forecasting (EAS 391F)
2009 Spring: Purdue University, Weather Analysis and Forecasting (EAS 43400)
2009 Spring: Purdue University, Computer-Aided Analysis for Geosciences (EAS 30900)
2008 Fall: Purdue University, Forecast Verification (EAS 591V)
2008 Fall: Purdue University, Team Weather Forecasting (EAS 391F)
2008 Spring: Purdue University, Weather Analysis and Forecasting (EAS 434)
2007 Fall: Purdue University, Physical Parameterizations in NWP (EAS 591U)
2007 Spring: Purdue University, Weather Analysis and Forecasting (EAS 434)
2005 Spring: University of Oklahoma, Instructor, Advanced Synoptic Meteorology
1991 Summer: University of Oklahoma, Instructor, Atmospheric Dynamics I
1988 Fall: University of Oklahoma, Teaching Assistant, Introduction to Meteorology

Research Interests

Numerical weather prediction, forecast verification, data assimilation, data mining

Research Grants

Co-principal investigator: The Response of Convective Precipitating Storms to Anthropogenically Enhanced Global Radiative Forcing, National Science Foundation award number 0756624, $616,112 (Sep 2008 - Aug 2011)

Co-principal investigator: The Application of a Successful Research-based Laboratory Model to Atmospheric Science, National Science Foundation award number 0837272, $150,000 (Jan 2009 - Dec 2011)

Co-principal investigator: An experimental, real-time prediction system for high-impact convective weather events. COMET Cooperative Research Project, UCAR Subaward number S08-66813 (Jan 2008 - Dec 2009: $46,400).

Co-principal investigator: Evaluating the new Weather Research and Forecasting (WRF) model at the Storm Prediction Center. COMET Cooperative Research Project, UCAR Subaward number S01-32796, continued as S03-44678 ($35,000).

Co-principal investigator: Creation, evaluation, and implementation of precipitation-type forecasting system. COMET Cooperative Research Project, UCAR Subaward number S00-19128.

Research associate: Development of mesoscale verification strategies for evaluating mesoscale numerical weather prediction models. COMET Cooperative Research Project, UCAR Subaward number S99-15805.

Invited Presentations

2009 NWS forecast office Indianapolis, IN seminar: convective parameterizations in NWP
2008 UCAR/WRF DTC Verification Workshop, Boulder, CO
2008 NCEP/EMC seminar: Verification Testbed Development, Camp Springs, MD
2008 NWS forecast office Indianapolis, IN seminar: WRF prediction of high-impact convective weather
2007 NWS forecast office North Webster, IN seminar: NWP and winter precipitation type
2007 UCAR/COMET COMAP course: NWP and winter precipitation type, Boulder, CO
2007 UCAR/DTC WRF verification toolkit workshop, Boulder, CO
2006 Department of Geography, Western Michigan University, seminar
2006 THORPEX-SERA Workshop, Boulder, CO
2006 Unidata user's workshop, Boulder, CO
2004 AMS Short Course on Significance Testing, Model Evaluation, and Alternatives, Seattle, WA
2003 UCAR/COMET COMAP course: convective parameterization, verification, Boulder, CO
2002 NCAR verification workshop: Making verification more meaningful, Boulder, CO
2002 NWS workshop on verification of gridded forecasts, Silver Spring, MD
2001 UCAR/COMAP Symposium on heavy precipitation and flash flooding, Boulder, CO
1999 NWS workshop on quantitative precipitation estimation, Boulder, CO

Professional Activities

2010	Co-convenor, NCAR/ASP Summer Colloquium: Forecast Verification in the Atmospheric Sciences and Beyond
2009-present	Member, AMS Committee on Artificial Intelligence Applications to Environmental Sci.
2008-present	Member, WRF DTC Verification working group
2007-present	Associate Editor, *Weather and Forecasting*
2004-2006	Associate Editor, *Monthly Weather Review*
2003	Lead author of National Weather Service Plan for Verification of Forecasts in the National Digital Forecast Database.
2001-2004	Research mentor, REU (Research Experience for Undergraduates) at the National Severe Storms Laboratory (2003, 2004), ORISE (Oak Ridge Institute for Science and Education) at the Storm Prediction Center (2001)
2000-2005	Co-principal investigator and participant, NSSL/SPC Spring Program (now NOAA Hazardous Weather Testbed).
2000-present	Member, WRF model post-processing working group. Developed WRF post-processing software currently in use at NCEP, NCAR, NSSL, and CAPS.
1997-2003	Developed workstation version of Eta Model including Kain-Fritsch convection, routinely produced daily real-time runs and specialized output for forecasters at Storm Prediction Center, Hydrometeorological Prediction Center, and community access.

Professional Society Memberships

American Meteorological Society
American Geophysical Union

Awards

2003	Received the American Meteorological Society Editor's Award for the journal *Weather and Forecasting* for "thoughtful, helpful, and detailed reviews that consistently assisted in improving submitted manuscripts."
2009	Received the Purdue University College of Science Faculty Award for Outstanding Contributions to Undergraduate Teaching by an Assistant Professor

Publications

REFEREED

Hitchens, N.M., R.J. Trapp, **M.E. Baldwin**, and A. Gluhovsky, 2010: Characterizing Subdiurnal Extreme Precipitation in the Midwestern United States. *J. Hydrometeor.*, **11**, 211–218.

Kain, J. S., S. J. Weiss, D. R. Bright, **M. E. Baldwin**, J. J. Levit, G. W. Carbin, C. S. Schwartz, M. Weisman, K. K. Droegemeier, D. Weber, K. W. Thomas, 2008: Some practical considerations regarding horizontal resolution in the first generation of operational convection-allowing NWP. *Wea. Forecasting,* **23**, 931-952.

Trapp, R. J., N. S. Diffenbaugh, H. E. Brooks, **M. E. Baldwin**, E. D. Robinson, and J. S. Pal, 2007: Changes in severe thunderstorm environment frequency during the 21st century caused by anthropogenically enhanced global radiative forcing. *Proc. Natl. Acad. Sci. USA*, **104**, 19,719-19,723.

Gallus, W. A., **M. E. Baldwin**, and K. L. Elmore, 2007: Evaluation of probabilistic precipitation forecasts determined from Eta and AVN forecasted amounts. *Wea. Forecasting,* **22**, 207-215.

Song, Y., J. Ye, N. Svakhine, S. Lasher-Trapp, **M. Baldwin**, and D. S. Ebert, 2006: An atmospheric visual analysis and exploration system. *IEEE Transactions on Visualization and Computer Graphics,* **12** (5), 1157-1164.

Elmore, K.L., D.M. Schultz, and **M.E. Baldwin**, 2006: The Behavior of Synoptic-Scale Errors in the Eta Model. *Mon. Wea. Rev.*, **134**, 3355–3366.

Lakshmivarahan, S., **M. E. Baldwin**, and T. Zheng, 2006: Further analysis of Lorenz's maximum simplification equations. *J. Atmos. Sci.*, **63**, 2673-2699.

Baldwin, M. E. and J. S. Kain, 2006: Sensitivity of several performance measures to displacement error, bias, and event frequency. *Wea. Forecasting*, **21**, 636-648.

Bukovsky, M. S., J. S. Kain, and **M. E. Baldwin**, 2006: Bowing convective systems in a popular operational model: Are they for real? *Wea. Forecasting,* **21**, 307-324.

Kain, J. S., S. J. Weiss, J. J. Levit, **M. E. Baldwin**, and D. R. Bright, 2006: Examination of convection-allowing configurations of the WRF Model for the prediction of severe convective weather: The SPC/NSSL Spring Program 2004. *Wea. Forecasting,* **21**, 167-181.

Stensrud, D. J., N. Yussouf, **M. E. Baldwin**, J. T. McQueen, J. Du, B. Zhou, B. Ferrier, G. Manikin, M. F. Ralph, J. M. Wilczak, A. B. White, I. Djlalova, J. W. Bao, R. J. Zamora, S. G. Benjamin, P. A. Miller, T. L. Smith, T. Smirnova, and M. F. Barth, 2006: The New England High-Resolution Temperature Program. *Bull. Amer. Meteor. Soc.*, **87,** 491-498.

Elmore, K. L., D. M Schultz, and **M. E. Baldwin**, 2006: Field significance revisited: Spatial bias errors in forecasts as applied to the Eta Model. *Mon. Wea. Rev.,* **134**, 519-531.

Baldwin, M. E., J. S. Kain, and S. Lakshmivarahan, 2005: Development of an automated classification procedure for rainfall systems. *Mon. Wea. Rev.,* **133,** 844-862.

Wandishin, M. S., **M. E. Baldwin**, S. L. Mullen, and J. V. Cortinas, 2005: Short-Range ensemble forecasts of precipitation type. *Wea. Forecasting,* **20,** 609-626.

Kurkowski, N. P., D. J. Stensrud, and **M. E. Baldwin**, 2003: Assessment of implementing satellite-derived land cover data in the Eta model. *Wea. Forecasting*, **18,** 404-416.

Kain, J. S., **M. E. Baldwin**, P. R. Janish, S. J. Weiss, M. P. Kay, and G. W. Carbin, 2003: Subjective verifi-

cation of numerical models as a component of a broader interaction between research and operations. *Wea. Forecasting*, **18,** 847-860.

Kain, J. S., P. R. Janish, S. J. Weiss, **M. E. Baldwin**, R. S. Schneider, and H. E. Brooks, 2003: Collaboration between forecasters and research scientists at the NSSL and SPC: The Spring Program. *Bull. Amer. Meteor. Soc.*, **84,** 1797-1806.

Kain, J. S., **M. E. Baldwin**, and S. J. Weiss, 2003: Parameterized updraft mass flux as a predictor of convective intensity. *Wea. Forecasting*, **18,** 106-116.

Ebert, E. E., U. Damrath, W. Wergen, and **M. E. Baldwin**, 2003: The WGNE assessment of short-term quantitative precipitation forecasts. *Bull. Amer. Meteor. Soc.*, **84,** 481-492.

Hane, C. E., R. M. Rabin, T. M. Crawford, H. B. Bluestein, and **M. E. Baldwin**, 2002: A case study of severe storm development along a dryline within a synoptically active environment. Part II: Multiple boundaries and convective initiation. *Mon. Wea. Rev.*, **130,** 900-920.

Baldwin, M. E., J. S. Kain, and M. P. Kay, 2002: Properties of the convection scheme in NCEP's Eta model that affect forecast sounding interpretation. *Wea. Forecasting*, **17,** 1063-1079.

Hane, C. E., **M. E. Baldwin**, H. B. Bluestein, T. M. Crawford, and R. M. Rabin, 2001: A case study of severe storm development along a dryline within a synoptically active environment. Part I: Dryline motion and an Eta model forecast. *Mon. Wea. Rev.*, **129,** 2183-2204.

Zapotocny, T. H., S. J. Nieman, W. P. Menzel, J. P. I. Nelson, J. A. Jung, E. Rogers, D. F. Parrish, G. J. DiMego, **M. Baldwin**, and T. J. Schmit, 2000: A case study of the sensitivity of the Eta data assimilation system. *Wea. Forecasting*, **15,** 603-621.

Kain, J. S., S. M. Goss, and **M. E. Baldwin**, 2000: The melting effect as a factor in precipitation-type forecasting. *Wea. Forecasting*, **15,** 700-714.

Zhao, Q., T. L. Black, and **M. E. Baldwin**, 1997: Implementation of the cloud prediction scheme in the Eta Model at NCEP. *Wea. Forecasting*, **12,** 697-712.

Hane, C. E., H. B. Bluestein, T. M. Crawford, **M. E. Baldwin**, and R. M. Rabin, 1997: Severe thunderstorm development in relation to along-dryline variability: A case study. *Mon. Wea. Rev.,* **125,** 231-251.

Mesinger, F., T. L. Black, and **M. E. Baldwin**, 1997: Impact of resolution and of the eta coordinate on skill of the Eta Model precipitation forecasts. *Numerical Methods in Atmospheric and Oceanic Modelling, The André J. Robert Memorial Volume*, C. Lin, R. Laprise, and H. Ritchie, Eds., Canadian Meteorological and Oceanographic Society/NRC Research Press, Ottawa, 399-423.

Rogers, E., T. L. Black, D. G. Deaven, G. J. DiMego, Q. Zhao, **M. Baldwin**, N. W. Junker, and Y. Lin, 1996: Changes to the operational "early" Eta analysis/forecast system at the National Centers for Environ-

mental Prediction. *Wea. Forecasting*, **11,** 391-413.

SUBMITTED

Trapp, R. J., E. D. Robinson, **M.E. Baldwin**, N. S. Diffenbaugh, and B. R. J. Schwedler, 2010: Regional climate of hazardous convective weather through high-resolution dynamical downscaling, submitted to *Climate Dynamics*.

REFEREED CONFERENCE PROCEEDINGS

Baldwin, M. E., 2009: Verification of the time evolution of precipitation systems in numerical weather forecasts. In: *18th World IMACS Congress and MODSIM09 International Congress on Modelling and Simulation*. Modelling and Simulation Society of Australia and New Zealand and International Association for Mathematics and Computers in Simulation, Anderssen, R.S., R.D. Braddock and L.T.H. Newham (eds), July 2009, 4177-4183. ISBN: 978-0-9758400-7-8. http://www.mssanz.org.au/modsim09/J1/baldwin.pdf

Baldwin, M. E. and S. Lakshmivarahan, 2003: Spatial characterization of rainfall patterns for use in a classification system. *Intelligent Engineering Systems Through Artificial Neural Networks*, **13**, C. H. Dagli, A. L Buczak, J. Ghosh, M. J. Embrechts, and O. Ersoy Eds, ASME Press, 683-688.

Baldwin, M. E. and S. Lakshmivarahan, 2002: Rainfall classification using histogram analysis: An example of data mining in meteorology. *Intelligent Engineering Systems Through Artificial Neural Networks*, **12**, C. H. Dagli, A. L. Buczak, J. Ghosh, M. J. Embrechts, O. Ersoy, S. W. Kercel, Eds., ASME Press, 429-434.

RESEARCH/CONFERENCE PRESENTATIONS

M. E. Baldwin, 2010: Evaluation of climate simulations and extreme weather predicitons, Purdue University Spatial Statistics and Statistical Climatology seminar series.

M. E. Baldwin, 2009: Evaluation of numerical forecasts of convective precipitation systems containing realistic detail, Purdue University Earth and Atmospheric Sciences seminar series.

Carley, J., **M. E. Baldwin**, J. Trapp, J. Kwiatkowski, J. Logsdon, and S. J. Weiss, 2009: Ongoing development of an experimental, real-time prediction system for high-impact convective weather events. Presentation for 23rd Conference on Weather Analysis and Forecasting/19th Conference on Numerical Weather Prediction, AMS, Omaha, NE, June 1-5, 2009, 3B.4.

Baldwin, M. E., and J. Carley, 2009: Tracking precipitating weather systems in forecast and observed data. Presentation for 7th Conference on Artificial Intelligence and its Application to the Environmental Sciences, AMS Annual Meeting, Phoenix, AZ, January 11-15, 2009, J7.3.

Baldwin, M.E., 2008: Multivariate cluster anlaysis for automated identification of precipitating weather systems. Conference presentation for 19th Conference on Probabillity and Statistics, New Orleans, LA, Amer. Meteor. Soc., J4.5.

Baldwin, M. E., A. Reinhart, C. Selby, and J. P. Sullivan, 2008: Evaluating the performance of WRF model high-altitude forecasts. Preprints, 13th Conference on Aviation, Range and Aerospace Meteorology, New Orleans, LA, Amer. Meteor. Soc., paper P2.12.

Baldwin, M. E., and R. J. Trapp, 2007: Object-oriented analysis of precipitation systems in NCEP Stage II analyses. Conference presentation for Fifth Conference on Artificial Intelligence Applications to Environmental Science, San Antonio, TX, Amer. Meteor. Soc., J3.10

INFORMAL PUBLICATIONS (selected from over 70 from work prior to starting at Purdue in 2006)

Baldwin, M., R. Treadon, and S. Contorno, 1994: Precipitation type prediction using a decision tree approach with NMC's mesoscale Eta Model. *Preprints, Tenth Conf. on Numerical Weather Prediction*, Portland, OR, Amer. Meteor. Soc., 30-31.

Baldwin, M. E., and K. E. Mitchell, 1997: The NCEP hourly multi-sensor U.S. precipitation analysis for operations and GCIP research. *Preprints, 13th Conf. on Hydrology*, February 2-7, 1997, Long Beach, California, Amer. Meteor. Soc., 54-55.

Baldwin, M. E., and T. L. Black, 1998: Post-frontal precipitation forecasting experiments in the western U. S. with NCEP's Eta-10 Model. *Preprints, 12th Conference on Numerical Weather Prediction*, 78th AMS Annual Meeting, January 11-16, 1998, Phoenix, Arizona, 217-218.

Baldwin, M. E, and S. D. Hrebenach, 1998: Experiments with bias-corrected temperature guidance using NCEP's Mesoscale Eta Model. *Preprints, 16th Conference on Weather Analysis and Forecasting*, 78th AMS Annual Meeting, January 11-16, 1998, Phoenix, Arizona, 388-389.

Baldwin, M. E., and J. S. Kain, and T. L. Black, 1998: Eta model forecast sensitivity to initial conditions for the 22/23 Feb 98 Florida tornadoes case. *Preprints, 19th AMS Conference on Several Local Storms*, Minneapolis, MN, 190-191.

Baldwin, M.E., S. Lakshmivarahan, and J.S. Kain, 2001: Verification of mesoscale features in NWP models. *Preprints, 9th Conf. on Mesoscale Processes*, Ft. Lauderdale, FL, Amer. Meteor. Soc., 255-258.

Baldwin, M. E., S. Lakshmivarahan, and J. S. Kain, 2002: Development of an "events-oriented" approach to forecast verification. *Preprints, 15th Conference on Numerical Weather Prediction*, San Antonio, TX, Amer. Meteor. Soc., 210-213.

Baldwin, M. E., and M. S. Wandishin, 2002: Determining the resolved spatial scales of Eta model precipitation forecasts. *Preprints, 15th Conference on Numerical Weather Prediction*, San Antonio, TX, Amer. Meteor. Soc., 85-88.

Baldwin, M. E., and S. Lakshmivarahan, 2003: Development of an events-oriented verification system using data mining and image processing algorithms. *AMS 2003 Annual Meeting Preprint CD*, 3rd Conf. Artificial Intelligence, Long Beach, CA, Amer. Meteor. Soc., paper 4.6.

Baldwin, M. E. and K. L. Elmore, 2005: Objective verification of high-resolution WRF forecasts during 2005 NSSL/SPC Spring Program. *Preprints, 17th Conference on Numerical Weather Prediction*, 1-5 August, Washington, DC, Amer. Meteor. Soc., paper 11B.4.

Baldwin, M. E. K. L. Elmore, D. C. Dowell, T. Fujita, L. J. Wicker, and D. J. Stensrud, 2006: Challenges in comparing realistic, high-resolution spatial fields from convective-scale grids. *Preprints, Symposium on the Challenges of Severe Convective Storms*, 30 Jan - 2 Feb, Atlanta, GA, Amer. Meteor. Soc., paper P1.28.

Black, T., **M. Baldwin**, K. Brill, F. Chen, G. DiMego, Z. Janjic, G. Manikin, F. Mesinger, K. Mitchell, E. Rogers, and Q. Zhao, 1997: Changes to the Eta Forecast Systems. NWS/OM Technical Procedures Bulletin 441, 12 pp.

Carr, F. H., and **M. E. Baldwin**, 1991: Incorporation of observed precipitation estimates during the initialization of synoptic and mesoscale storms. *Preprints, AMS First International Symposium of Winter Storms*, 14-18 January, New Orleans, LA, Amer. Meteor. Soc. 71-75.

Chen, F., K. Mitchell, Z. Janjic, and **M. Baldwin**, 1996: Land-surface modeling progress in the NCEP mesoscale Eta model. *Preprints, 11th Conf. on Numerical Weather Prediction*, 19-23 August, Norfolk, VA, Amer. Meteor. Soc., 257-258.

Cortinas, J.V., Jr., K. F. Brill, **M. E. Baldwin**, 2002: Probabilistic forecasts of precipitation type. *Preprints, 16th Conf. On Probability and Statistics in the Atmospheric Sciences*, Orlando, FL, AMS, 140-145.

Janish, P. R., S. J. Weiss, J. S. Kain, and **M. E. Baldwin**, 2001: Advancing operational forecasting through collaborative applied research programs at the Storm Prediction Center and National Severe Storms Laboratory. *Preprints, 18th Conference on Weather Analysis and Forecasting*, 30 July - 2 August, Ft. Lauderdale, FL.Amer. Meteor. Soc., paper P3.17.

Kain, J. S., S. J. Weiss, **M. E. Baldwin**, G. W. Carbin, D. Bright, J. J. Levit, and J. A. Hart, 2005: Evaluating high-resolution configurations of the WRF model that are used to forecast severe convective weather: The 2005 SPC/NSSL Spring Experiment. *Preprints, 21st Conference on Weather Analysis and Forecasting,* 1-5 August, Washington, DC, Amer. Meteor. Soc., paper 2A.5.

Kay, M. P. and **M. E. Baldwin**, 2002: Combining objective and subjective information to improve forecast evaluation. *Preprints, 19th Conference on Weather Analysis and Forecasting,* 11-15 August, San Antonio, TX, Amer. Meteor. Soc., 411-414.

Lin, Y., **M.E. Baldwin**, K.E. Mitchell, E. Rogers, and G.J. DiMego, 2001: Spring 2001 changes to NCEP Eta analysis and forecast system: Assimilation of observed precipitation data. *Preprints, 9th Conf. on Mesoscale Processes*, Ft. Lauderdale, FL, Amer. Meteor. Soc., J92-J95.

Mathur, M. B., T. L. Black, J. P. Gerrity, and **M. Baldwin**, 1993: Impact of Analysis Errors Over Data Sparse Eastern Pacific Ocean on the Eta Model's Forecasts. NMC Office Note 399, Washington DC, August 1993, 19 pp.

Rogers, E., T. Black, D. Deaven, G. DiMego, Q. Zhao, Y. Lin, N. Junker, and **M. Baldwin**, 1995: Changes to the NMC operational Eta model analysis/forecast system. NWS Technical Procedures Bulletin No. 423, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 51 pp.

Rogers, E., **M. Baldwin**, T. Black, K. Brill, F. Chen, G. DiMego, J. Gerrity, G. Manikin, F. Mesinger, K. Mitchell, D. Parrish, and Q. Zhao, 1997: Changes to the NCEP Operational "Early" Eta Analysis / Forecast System. NWS/OM Technical Procedures Bulletin 447.

Skamarock, W. C., **M. E. Baldwin**, and W. Wang, 2004: Evaluating high-resolution NWP models using kinetic energy spectra. *Preprints, First Joint WRF/MM5 User's Workshop*, NCAR, Boulder, CO, paper 2.2.