

Christina P. Kalb
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OVERVIEW

Atmospheric scientist with 12 years of experience in research and 2 years in consulting. My background includes strong experience in model verification, statistics, data analysis, computer programming and outreach. I've worked with everything from convection allowing models to global coupled climate models, and have strong experience with the Model Evaluation Tools package. Specifically, my areas of expertise are thunderstorms, cloud electrification and the global electric circuit, convection, aviation weather, and radar meteorology.

EDUCATION

Master of Science in Atmospheric Science

Colorado State University, Fort Collins, CO

thesis: Cloud-to-Ground Lightning Polarity and Environmental Conditions over the Central United States

August 2007

GPA: 3.917

Bachelor of Science in Atmospheric Sciences, Summa Cum Laude

The Ohio State University, Columbus, OH

March 2004

GPA: 3.91

EXPERIENCE

Associate Scientist III

Feb 2017 – present

National Center for Atmospheric Research, Boulder, CO

- Set up verification statistics and performance scorecards for the HWT Spring Experiment 2018 using MET Tools and METplus verification systems
- Performed point-based verification for solar and wind energy forecasts
- Used object-based methods to identify similar forecast mesoscale convective systems
- Converted scripts to perform a weather regime analysis and compute atmospheric blocking into a python scripting verification system
- Used object-based methods to examine the blockage in a latitude/longitude region resulting from weather to help determine the impact on airspace capacity
- Performed an object-based verification of multiple hail algorithms

Associate Scientist II

Feb 2009 – Feb 2017

National Center for Atmospheric Research, Boulder, CO

- Developed a self-adjusting HRRR model calibration by matching frequencies between modeled and observed precipitation intensity distributions; the calibration was employed in real time
- Evaluated HRRR model forecasts of convection/thunderstorms for real time applications
- Evaluated oceanic precipitation rate forecasts from multiple global ensemble models to using MET Tools determine the best combination for real-time use
- Performed an object-based verification on climate data, including temperature, precipitation, and sea ice and examined their relationship to ENSO
- Created a parameterization for electrified clouds in a global climate model using regression analysis
- Performed statistical analysis on convective initiation forecast using a random forest technique
- Identified and documented turbulence cases over Taiwan associated with different cloud regimes (typhoons, thunderstorms, etc.) using NTDA
- Wrote a set of programs which takes irregularly spaced watershed data and converts it to a grid of the user's choice for use as model input

Atmospheric Scientist

CPP Inc., Fort Collins, CO

June 2007 – Feb 2009

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- Consultant on various atmospheric science and wind engineering topics
- Obtained and analyzed noise measurements from operational wind farms for use in determining future wind farm locations
- Assessed meteorological cause of damage to structures and determined the percentage of damage resulting from specific meteorological phenomena
- Evaluated meteorological conditions associated with high amplitude power line oscillation and developed a climatology for use in predicting future oscillation events
- Analyzed the effects of complex terrain on wind flow for use in determining mining pile locations

Graduate Research Assistant

July 2004 – May 2007

Department of Atmospheric Sciences, Colorado State University, Fort Collins, CO

- Performed a composite statistical analysis comparing the environmental conditions of thunderstorms dominated by positive versus negative lightning
- Served as teaching assistant for Introduction to Weather and Climate class, and instructor for the laboratory portion, Aug 2005 – Dec 2005

Research Experience for Undergraduates Program

June 2003 – Aug 2003

National Weather Center, Norman, OK

- Performed visual and statistical analysis comparing the performance of multiple cloud reporting instruments from the Atmospheric Radiation Measurement (ARM) program
- Wrote a scientific paper and presented research at the National Severe Storms Laboratory
- Gained a better understanding of how to communicate effectively when writing or presenting scientific work

Weather Assistant

Oct 1999 – June 2001

Channel 12 News, Cincinnati, OH

- Updated and rendered meteorological graphics for television and web page forecasts
- Worked on small research projects including examining past meteorological data and drawing conclusions based upon trends

COMPUTER SKILLS

- Experience in IDL, NCL, R, MATLAB, Fortran, Python, C++, shell scripting, NCO, DTC MET Tools, METplus, METplotpy, METcalcpy, GitHub, Microsoft Excel, Word, and Power Point
- Model experience includes: HRRR/HRRR-E, HREFv2, GFS, GEFS, CMCE, ECMWF, CESM, GFDL, NSSL-FV3
- Operating systems: Windows and Linux

HONORS/AWARDS

- NCAR Special Recognition Award for my video contribution to the Super Science Saturday Wizard show, Dec 2020
- NCAR Special Recognition Award for data analysis and beta version software development, Dec 2010
- Member of Phi Kappa Phi and Golden Key International Honor Society

OUTREACH

- Wizard, NCAR Super Science Saturday Wizard show Nov 2018, Nov 2020
- Invited talk, NCAR Meet the Experts Sept 2020
- Judge, Globe International Virtual Science Symposium Mar 2017
- Judge, Colorado STEM Academy Science Fair Jan 2016
- Volunteer, NCAR Super Science Saturday Nov 2014, Oct 2012
- Volunteer, Girl Scouts at NCAR Feb 2014
- Space Odyssey Volunteer at the Denver Museum of Nature and Science 2008 – 2011

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AFFILIATIONS

- American Meteorological Society 2000 – present
- Vice President/Treasurer of The Ohio State University Meteorology Club 2002 – 2004

MENTORING

- Co-mentored two students from the Significant Opportunities in Atmospheric Research and Science Program, May – July 2012, 2013

REFEREED PUBLICATIONS

- Brown, B., T. Jensen, J. Halley Gotway, R. Bullock, E. Gilleland, T. Fowler, K. Newman, D. Adriaansen, L. Blank, T. Burek, M. Harrold, T. Hertneky, C. Kalb, P. Kucera, L. Nance, J. Opatz, J. Vigh, and J. Wolff, Early Online Release: The Model Evaluation Tools (MET): More than a decade of Community Supported Forecast Verification, *Bull. Amer. Meteor. Soc.*, doi:10.1175/BAMS-D-19-0093.1.
- Gallo, B., T., C. P. Kalb, J. Halley Gotway, H. H. Fisher, B. Roberts, I. L. Jirak, A. J. Clark, C. Alexander, and T. Jensen, 2019: Initial Development and Testing of a Convection-Allowing Numerical Weather Prediction Scorecard, *Bull. Amer. Meteor. Soc.*, 100, ES367–ES384, doi:10.1175/BAMS-D-18-0218.1.
- Tye, M. R., S. E. Haupt, E. R. Gilleland, C. P. Kalb, and T. Jensen, 2019: Assessing Evidence for Weather Regimes Governing Solar Power Generation in Kuwait, *Energies*, 12, 4409, doi:10.3390/en12234409.
- Peterson, M. J., W. Deierling, C. Liu, D. Mach, and C. P. Kalb, 2018: A TRMM assessment of the Composition of the Generator Current that supplies the global electric circuit, *J. Geophys. Res. Atmos.*, 123, 8208-8220, doi:10.1029/2018JD028844.
- Peterson, M. J., W. Deierling, C. Liu, D. Mach, and C. P. Kalb, 2018: Retrieving Global Wilson Currents from Electrified Clouds using Satellite Passive Microwave Observations, *J. Atmos. Oceanic Technol.*, 35, 1487-1503, doi:10.1175/JTECH-D-18-0038.1.
- Jansky, J., G. M. Lucas, C. P. Kalb, V. Bayona, M. J. Peterson, W. Deierling, N. Flyer, and V. P. Pasko, 2017: Analysis of the diurnal variation of the global electric circuit obtained from different numerical models, *J. Geophys. Res. Atmos.*, 122, 12,906-12,917, doi:10.1002/2017JD026515.
- Peterson, M. J., W. Deierling, C. Liu, D. Mach, and C. P. Kalb, 2017: A TRMM/GPM retrieval of the total mean generator current for the global electric circuit, *J. Geophys. Res. Atmos.*, 122, 10,025-10,049, doi:10.1002/2016JD026336.
- Kalb, C. P., W. Deierling, A. Baumgaertner, M. J. Peterson, C. Liu, and D. Mach, 2016: Parameterizing total storm conduction currents in the Community Earth System Model. *J. Geophys. Res. Atmos.*, 121, 13715-13,734, doi:10.1002/2016JD025376.
- Peterson, M. J., W. Deierling, C. Liu, D. Mach, and C. P. Kalb, 2017: The properties of optical lightning flashes and the clouds they illuminate, *J. Geophys. Res. Atmos.*, 122, 423-42, doi:10.1002/2016JD025312.
- Peterson, M., C. Liu, D. Mach, W. Deierling, and C. P. Kalb, 2015: A Method of Estimating Electric Fields above Electrified Clouds from passive Microwave Observations. *J. Atmos. Oceanic Technol.*, 32, 1429-1446, doi:10.1175/JTECH-D-14-00119.1.

CONFERENCE PRESENTATIONS

- Kalb, C. P., W. Deierling, C. Kessinger, D. Megenhardt, and S. Ellis, 2021: Verification of a WRF Hail Classification Scheme at Military Test Ranges, *Poster*, 21st Conference on Aviation, Range, and Aerospace Meteorology, Amer. Meteor. Soc., virtual, 642.
- Ellis, S., C. Kessinger, D. Serke, C. Kalb, D. Megenhardt, S. Dettling, and J. C. Knievel, 2021: Convection Nowcasting Products Available at the Army Test and Evaluation Command Ranges, *Poster by Ellis*, 21st Conference on Aviation, Range, and Aerospace Meteorology, Amer. Meteor. Soc., virtual, 646.
- Jensen, T., C. Kalb, L. R. Blank, J. Halley Gotway, B. Gallo, R. Adams-Selin, H. H. Fisher, and H. Soh, 2021: Advancements in METplus Verification and Diagnostic Capability for Short-Term Forecast

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- Evaluation, *Presented by Jensen*, 11th Conference on the Transition of Research to Operations, Amer. Meteor. Soc., virtual, 12.3.
- Gettelman, A., D. Coleman, C. P. Kalb, and T. L. Jensen, 2020: Process Oriented Diagnostics for High Frequency Impact Events: Bringing the Weather Scale to Climate, *Presented by Gettelman*, 2020 Fall Meeting, AGU, virtual, GC105-03.
 - Kalb, C. P., T. Jensen, B. T. Gallo, R. Adams-Selin, A. J. Clark, B. Roberts, P. S. Skinner, and C. R. Alexander, 2020: Evaluation of Convective Storm Attributes using Advance Verification Techniques during HWT 2019, *Presented*, 26th Conference on Probability and Statistics, Amer. Meteor. Soc., Boston, MA, 3.3.
 - Adams-Selin, R., C. P. Kalb, P. S. Skinner, and T. Jensen, 2020: Comparison of Object-Based and Grid-Based Verification of Warn-on-Forecast System HAILCAST Forecasts, *Presented by Adams-Selin*, 30th Conference on Weather Analysis and Forecasting /26th Conference on Numerical Weather Prediction, Amer. Meteor. Soc., Boston, MA, 2B.2.
 - Jensen, T., J. Halley Gotway, C. P. Kalb, L. R. Blank, D. R. Adriaansen, D. W. Fillmore, 2020: The Use of the METplus Verification and Diagnostic Capability in Short-Term Forecast Evaluation, *Presented by Jensen*, 10th Conference on the Transition of Research to Operations, Amer. Meteor. Soc., Boston, MA, 9.5.
 - Stone, K., J. O. Pinto, C. P. Kalb, C. Kessinger, W. Deierling, M. Steiner, J. Grim, T. Blitz, R. Bass, J. M. Baker, and M. Strahan, 2020: Global Probabilistic Forecasts of Convective Weather Aviation Hazards, *Presented by Stone*, 20th Conference on Aviation, Range, and Aerospace Meteorology, Amer. Meteor. Soc., Boston, MA, 11.3.
 - Jensen, T., J. Halley Gotway, G. P. McCabe, J. Frimel, M. P. Row, F. G. Bullock, T. L. Fowler, D. W. Fillmore, B. Strong, M. Marquis, M. Win-Gildenmeister, J. Prestopnik, D. R. Adriaansen, And C. P. Kalb, 2020: The Use of the METplus Verification and Diagnostic Capability in Forecast Evaluation across Multiple Scales and Applications, *Presented by Jensen*, 30th Conference on Weather Analysis and Forecasting /26th Conference on Numerical Weather Prediction, Amer. Meteor. Soc., Boston, MA, 1B.6.
 - Kalb, C., P., T. Jensen, B. T. Gallo, A. J. Clark, B. Roberts, P. S. Skinner, and C. Alexander, 2019: Testing of Scorecards for Convection Allowing Models during HWT 2018, *Presented*, 9th Conference on the Transition of Research to Operations, Amer. Meteor. Soc., Phoenix, AZ, 9B.4.
 - Jensen, T., A. J. Clark, J. A. Nelson Jr., B. L. Twiest, J. L. Demuth, C. P. Kalb, D. R. Adriaansen, S. Perfater, B. Albright, B. Roberts, M. Erickson, and J. Halley Gotway, 2019: Applications of METplus to NOAA Testbeds to Accelerate Improvements in Short-Term Forecasting of High Impact Events, *Presented by Halley Gotway*, 9th Conference on the Transition of Research to Operations, Amer. Meteor. Soc., Phoenix, AZ, 6B.1.
 - Stone, K. A., J. O. Pinto, M. Strahan, R. Bass, M. Steiner, C. P. Kalb, C. J. Kessinger, J. Pearson, and J. Grim, 2019: Improving Probabilistic Forecasts of Aviation Weather Hazards. *Presented by Stone*, 19th Conference on Aviation, Range, and Aerospace Meteorology, Amer. Meteor. Soc., Phoenix, AZ, 14.1.
 - Kalb, C., P., T. Jensen, B. T. Gallo, A. J. Clark, B. Roberts, P. S. Skinner, and C. Alexander, 2018: Testing of Scorecards for Convection Allowing Models during HWT 2018, *Presented*, 29th Conference on Severe Local Storms, Amer. Meteor. Soc., Stowe, VT, 14.5.
 - Brown, B., C. Amman, C. Kalb, R. Bullock, and C. Coelho, 2018: S2S Verification approaches: The challenge to provide meaningful information, *Presented by Brown*, Workshop on Metrics, Post-Processing and Products for S2S, College Park, MD.
 - Stone, K., J. O. Pinto, M. Steiner, M. Strahan, R. Bass, and C. P. Kalb, 2018: Calibrated Probabilistic Forecasts of Aviation Hazards using Multiple Global Ensembles, *Presented by Stone*, 6th Aviation, Range, and Aerospace Meteorology Special Symposium, Amer. Meteor. Soc. Annual Meeting, Austin, TX, 2.1.
 - Brown, B. G., C. P. Kalb, C. M. Ammann, and R. G. Bullock, 2018: Spatial Approaches to Evaluation of Climate Variability Projections and Predictions, *Presented by Brown*, 9th Conference on Weather, Climate, and the New Energy Economy, Amer. Meteor. Soc. Annual Meeting, Austin, TX, 6.7.

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- Kalb, C. P., B. Brown, C. M. Ammann, R. G. Bullock, and E. Gilleland, 2017: Verifying the Representation of Regional Climate Variability in a GCM using Object-based Methods, *Presented*, 5th WGNE Workshop on Systematic Errors in Weather and Climate Models, Montreal, Quebec, Canada.
- Stone, K. A., J. O. Pinto, M. Steiner, C. J. Kessinger, C. P. Kalb, and M. Strahan, 2017: Ensemble Prediction of Oceanic Convective Hazards. *Presented by Stone*, 18th Conference on Aviation, Range, and Aerospace Meteorology, Amer. Meteor. Soc., Seattle, WA, 3.4.
- Lavigne, T. P., C. Liu, W. Deierling, C. P. Kalb, M. Peterson, and D. M. Mach, 2017: Relationship Between the Global Electric Circuit and Electrified Cloud Parameters at Diurnal, Seasonal, and Interannual Timescales. *Poster by Lavigne*, 8th Conference on the Meteorological Application of Lightning Data, Amer. Meteor. Soc., Seattle, WA, 304.
- Kalb, C. P., W. Deierling, M. J. Peterson, and C. Liu, 2015: Total storm conduction current parameterization in a global model. *Presented*, 2015 Fall Meeting, AGU, San Francisco, CA, AE12A-08.
- Deierling, W., C. P. Kalb, M. J. Peterson, C. Liu, D. M. Mach, and R. J. Blakeslee, Conduction currents in oceanic and continental electrified clouds, *Poster by Deierling*, 2015 Fall Meeting AGU, San Francisco, CA, AE31C-0458.
- Peterson, M. J., W. Deierling, C. Liu, D. Mach, and C. P. Kalb, On the variations of electricity, lightning and storm properties. *Poster by Peterson*, Fall Meeting AGU, San Francisco, CA, AE31C-0460.
- Kalb, C. P., W. Deierling, A Baumgaertner, D. Mach, C. Liu, and M. J. Peterson, 2014: Parameterizing total storm conduction currents derived in a global model. *Poster*, XV International Conference on Atmospheric Electricity, Norman, OK, P-10-04.
- Deierling, W., C. P. Kalb, D. Mach, C. Liu, M. J. Peterson, and R. Blakeslee, 2014: On the variability of Wilson Currents by storm type and phase. *Presented by Deierling*, XV International Conference on Atmospheric Electricity, Norman, OK, O-10-02.
- Kalb, C. P., W. D. Deierling, D. Mach, C. Liu, and M. Peterson, 2013: Total Storm Currents and their Relationship to Microphysical and Dynamical Cloud Properties. *Poster*, 2013 Fall Meeting, AGU, San Francisco, CA, AE23B-0421.
- Deierling, W. D., C. P. Kalb, D. Mach and C. Liu, 2013: Total Storm Currents in Relation to Storm Type and Life Cycle. *Poster by Deierling*, 2013 Fall Meeting, AGU, San Francisco, CA, AE23B-0427.
- Peterson, M. J., C. Liu, D. Mach, W. D. Deierling, and C. P. Kalb, 2013: Of Ice and Charging: A look at Thundercloud Electric Fields and Passive Microwave Observations. *Poster by Peterson*, 2013 Fall Meeting, AGU, San Francisco, CA, AE13B-0347.
- Deierling, W., D. M. Mach, C. P. Kalb, S. A. Al-Momar, and D. J. Cecil, 2013: Conduction currents in relation to cloud properties of different storm types. *Poster by Deierling*, 6th Conference on the Meteorological Applications of Lightning Data, Austin, TX, 740.
- Al-Momar, S., W. Deierling, C. P. Kalb, K. Kosmenko, D. Mach, and D. Cecil, 2013: Relating electrified cloud properties to Wilson Currents: An oceanic and continental case study. *Poster by Al-Momar*, AMS 12th Annual Student Conference, Austin, TX, S99.
- Cai, H., M. Steiner, J. A. Grim, C. P. Kalb, C. J. Kessinger, J. Pinto, K. Stone, and M. Strahan, 2013: Probabilistic convective storm guidance for strategic planning of offshore and transoceanic flights. *Poster by Steiner*, 16th Conference on Aviation, Range, and Aerospace Meteorology, Austin, TX, 628.
- Kalb, C. P., J.O. Pinto, and S.A. Dettling, 2011: Evaluation of Modeled Precipitation Intensity Distributions and their Application to Short Term Forecasting. *Presented*, 24th Conference on Weather and Forecasting/20th Conference on Numerical Weather Prediction, Amer. Meteor. Soc., Seattle, WA, 1B.2.
- Kalb, C. P., A.R. Dean, R.A. Peppler, and K.L. Sonntag, 2004: Intercomparison of Cloud Base Height at the ARM Southern Great Plains Site. *Poster*, 14th ARM Science Team Meeting, Albuquerque, NM.
- Kalb, C. P., A.R. Dean, R.A. Peppler, and K.L. Sonntag, 2004: Intercomparison of Cloud Base Height at the ARM Southern Great Plains Site. *Poster*, 3rd Annual Student Conference, Amer. Meteor. Soc., Seattle, WA, P1.7.

OTHER PUBLICATIONS/PRESENTATIONS

Kalb

- Kalb, C. P. and B. Vanderwende, *What's Up with the Weather?*, *Presented*, NCAR Super Science Saturday, virtual, Nov 2020.
- Kalb, C. P., *Raising the Alert: Improving Prediction of Severe Weather*, *Presented*, NCAR Meet the Experts, virtual, Sept 2020.
- Kalb, C. P., *Categorical Verification*, *Presented*, MET Tutorial, Boulder, CO, Feb 2019.
- Kalb, C. P., *Gen-Vx-Mask and Regridding*, *Presented*, MET Tutorial, Boulder, CO, Feb 2019.
- Kalb, C. P., *Ensemble_Stat*, *Presented*, MET Tutorial, Boulder, CO, Feb 2019.
- Kalb, C. P., *MODE Customization and Output*, *Presented*, MET Tutorial, Feb 2019.
- Kalb, C. P., B. Brown, C. Ammann, R. Bullock, and E Gilleland: *EASM Verification: Application of Spatial Methods to Climate Predictions*, *Presented*, RAL Internal R&D Review on Verification Research and Verification and Diagnostic Tools, Boulder, CO, 7 Mar 2018.
- Jensen, T., J. Halley Gotway, T. Fowler, R. Bullock, T. Burek, J. Prestopnik, M. Win-Gildenmeister, P. Kucera, C. Kalb, D. Adriaansen, B. Brown, E. Gilleland, K. Newman, J. Wolff, and M. Harrold, MET+, *Feature Relative VX, Scorecarding, Renewables VX*, *Presented by Jensen*, RAL Internal R&D Review on Verification Research and Verification and Diagnostic Tools, Boulder, CO, 7 Mar 2018.
- Kalb, C. P., *Categorical Verification*, *Presented*, MET Tutorial, Boulder, CO, 31 Jan 2018.
- Kalb, C. P., *Stat_Analysis Tool*, MET Tutorial, *Presented*, Boulder, CO, 1 Feb 2018.
- Kalb, C. P., *Ensemble_Stat*, *Presented*, MET Tutorial, Boulder, CO, 1 Feb 2018.
- Kalb, C. P., *MODE Customization and Output: Verifying with Objects*, *Presented*, MET Tutorial, 2 Feb 2018.
- Brown, B., C. Ammann, C. Kalb, R. Bullock, and E. Gilleland, *EASM-VSA: Challenges in regional verification of climate variability projections and predictions*, *Presented by Brown*, SDWG Meeting, Boulder, CO, 2017.
- Kalb, C. P., W. Deierling, M. J. Peterson, and C. Liu, 2016: *Total storm conduction current parameterization in a Global Model*. *Presented*, Community Earth System Model Whole Atmosphere Working Group Meeting, Boulder, CO.
- Deierling, W., M. Peterson, and C. P. Kalb, 2015: *Global Electric Circuit*. *Co-presented*, RAL Retreat, Boulder, CO.
- Kalb, C. P. and W. Deierling, 2013: *Electrical connections and consequences within the earth system: project overview*. *Presented*, Space Foundation's Meteorology and Space Weather one-week Program, Boulder, CO.