

**PERSONAL DETAILS**

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Project Scientist I  
National Center for Atmospheric Research (NCAR)

Joint Numerical Testbed Program (JNTP)  
NCAR Research Applications Laboratory (RAL)  
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**Citizenship:** United States of America  
**Birth date:** 12 August 1977  
**Birthplace:** Tappahannock, Virginia  
**Hometown:** Lexington, Kentucky  
**Ethnicity:** Caucasian / Native American  
**Tribal membership:** Seneca Nation of Indians



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**Web of Science** [B-7604-2008](https://pubs.wos.org/author/7604-2008)

**EDUCATION**

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April 2010	<b>Ph.D.</b>	<b>Department of Atmospheric Science, Colorado State University</b>	<b>3.87 GPA</b>
		Dissertation: "Formation of the Hurricane Eye" <i>Advisor:</i> Wayne H. Schubert, Ph.D.	
July 2004	<b>M.S.</b>	<b>Department of Atmospheric Science, Colorado State University</b>	<b>3.82 GPA</b>
		Thesis: "Forecasting of Atlantic Tropical Cyclones Using a Kilo-Member Ensemble" <i>Advisor:</i> Wayne H. Schubert, Ph.D.	
May 2000	<b>B.S.</b>	<b>Department of Meteorology, Pennsylvania State University</b>	<b>4.00 GPA</b>
		Major in Meteorology, graduated with highest honors ( <i>Summa cum laud</i> )	

**PROFESSIONAL EXPERIENCE**

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Jan 2012 – Present     **Project Scientist I**, Joint Numerical Testbed Program (JNTP), Research Applications Laboratory, NCAR, Boulder, CO

*Current roles, responsibilities, and supervisor:*

- Work on a variety of projects in RAL, primarily in JNT.
- Principal Investigator for several projects including the HurricaneRiskCalculator® web app.
- Lead Developer for the Tropical Cyclone Guidance Project (TCGP).
- Lead Developer for the Climate Risk Management engine (CRMe).
- Lead Developer for the Space Weather Prediction Center Real-Time Evaluation System (SWPC-RT).
- Serving in project management role for the TC diagnostics project.

- Develop proposals to build up new projects at RAL.
- Supervisor: Paul Kucera (NCAR/RAL/JNTP)

### **Current Projects:**

#### *Tropical Cyclone Guidance Project (Feb 2010 – present)*

- Role: Lead developer
- Effort since 2012: 3.0 months
- Goals: (1) provide a global repository of tropical cyclone forecast aids for track, intensity, and structure information, (2) provide real-time plots of these data for active tropical cyclones, (3) visualize structure and intensity parameters from observations taken by reconnaissance aircraft, (4) provide retrospective plots of these data for past tropical cyclones, (5) provide real-time data sources needed to foster and support researchers in developing new prediction techniques, (6) support research into advanced visualization, and (7) advance probabilistic forecast guidance.
- Project web site: <https://www.ral.ucar.edu/hurricanes/>

#### *HurricaneRiskCalculator® (Aug 2017 – present)*

- Role: Principal Investigator (PI) across multiple lines of internal funding
- Effort since 2017: 8.1 months
- Funding:
  - RAL Opportunity Fund (FY2017)
  - UCAR President's Strategic Initiative Fund Scientific Research Award (FY2019)
  - NCAR Early Career Faculty Innovators Program (National Science Foundation, FY2021, support for Fernando Tormos-Aponte's grant)
  - NCAR Education & Outreach Diversity Grant (FY2022)
- Overview: The HurricaneRiskCalculator® web app is a risk tool which aims to transform hurricane risk communication by localizing hurricane wind hazards to a user's address and then intersecting this with the structural vulnerability of the user's residential building. The resulting wind risks will be communicated to users in a color-coded impact schema, along with the risk (expressed in probability) of specific consequences such as types and levels of structural and non-structural damage (fences and outbuildings, shingles/gutters, water ingress, major roof and wall damage, and complete failure of the structure).
- Goals: (1) develop a new paradigm for personalized, location-based hurricane hazard and risk outputs; (2) lead development of a cloud-based infrastructure and accompanying web app to provision these capabilities to users at scale; (3) develop partnerships with leading groups across academia to bring in the relevant multi-disciplinary expertise needed; (4) establish research licenses with our key collaborators; (5) develop a Privacy Policy; (6) develop a Terms of Use; (7) secure Intellectual Property protections; (8) develop and implement novel risk communication approaches; (9) conduct a national test to evaluate the performance of the web app; and (10) develop and implement a fundraising strategy to ensure HurricaneRiskCalculator remains available as a free resource to the public.
- Outcomes to date: (1) Lead development of the first national-scale address-based, real-time hurricane wind hazard web app; (2) the web app, implemented using serverless architecture in Amazon Web Services, is

capable of providing wind hazard outputs to users at scale under high-use conditions at a very cost-effective rate; (3) developed a Researcher Collective with more than 40 academic and industry experts across 10 disciplines; (4) established research licenses with our key partners to legally use their contributed components in the overall web app's framework; (5) developed a Privacy Policy in accordance with UCAR's privacy policies and national and international privacy regulations; (6) contributed to the development of a Terms of Use with a legal disclaimer and restrictions to ensure proper use; (7) worked with legal counsel to secure Intellectual Property protections resulting in receiving the registered trademark *HurricaneRiskCalculator*® in the secondary registry of the U.S. Patent Office; (8) developed and implemented novel risk communication approaches informed by social science; (9) conducted a national pilot test to evaluate the performance of the web app under high use conditions (as of 28 November, the web app has 2578 users and supported 1100 concurrent users during Hurricane Ian); and (10) developed and implemented a fundraising strategy to ensure HurricaneRiskCalculator remains available as a free resource to the public.

- Project-related resources:
  - Project web site: <https://wxrisk.ucar.edu>
  - Web app: <https://wxrisk.io>
  - Fundraising portal: <https://hurricaneriskcalculator.funraise.org/>

*Predicting Extreme Rapid Intensification (Aug 2018 – present)*

- Role: Co-PI (NCAR PI)
- Effort to date: 5.0 months
- Funding: NOAA Hurricane Forecast Improvement Project via the Massachusetts Institute of Technology (sub-award)
- Goals: (1) Develop novel techniques for predicting tropical cyclone rapid intensification; (2) augment observational and developmental datasets to use for training/testing forecast aids; (3) develop an advanced probabilistic forecast aid that is both reliable and capable of capturing extreme rapid intensification events.
- Outcomes to date: (1) Made major improvements and extensions to the Enhanced Vortex Data Messages Structure and Intensity Dataset (VDM+) and the Extended Flight Level Dataset for Tropical Cyclones (FLIGHT+); (2) oversaw and supported additional outcomes by the project team including a Hurricane LOGistic regression model (HLOG); (3) developed a probabilistic-to-deterministic prototype forecast framework called the Generalized Rapid Intensification Prediction (GRIP); (4) worked with Jonathan Lin, a PhD student at the Massachusetts Institute of Technology, to improve his Forecasts of Hurricanes using Large-ensemble Outputs (FHLO, a probabilistic hurricane wind hazard model) and support real-time runs at NCAR since 2019; (5) incorporated the FHLO outputs into TCGP and HurricaneRiskCalculator to disseminate these to the public.
- Project-related resources:
  - FLIGHT+ Dataset: <https://verif.rap.ucar.edu/tcdata/flight/>
  - VDM+ Dataset: <https://verif.rap.ucar.edu/tcdata/vortex/>
  - TCGP Guide to Probabilistic Plots: <http://hurricanes.ral.ucar.edu/guide/probwind/>

*Space Weather Prediction Center Real-time Evaluation System (Oct 2018 – present)*

- *Role:* Co-PI (Project Leader: Tara Jensen)
- *Effort to date:* 6.0 months
- *Funding:* NOAA National Environmental Satellite, Data, and Information Service (NESDIS)
- *Goal:* Develop an evaluation system for space weather using METplus capable of running on multiple operating systems and handling the unique requirements of the space weather domain. The system should be capable of undertaking gridded and object-based workflows.
- *Outcomes to date:* (1) Developed an evaluation system using METplus capable of running natively on Linux and seamlessly on MacOSX, Linux, and Windows Subsystem-for-Linux (WSL-2) inside docker containers; (2) developed an automated installation script which handles the complex setup of the Dockerized system; (3) developed an integrated driver system to allow for easy implementation of real-time workflows; (4) developed end-to-end workflows (also known as use cases) for gridded and object-based comparisons using MET's GridStat and MODE tools which provide graphical output; (5) implemented Python-embedding scripts to read non-standard file formats of several space weather models and analyses.

*Ensemble RI Project (Oct 2018 – present)*

- *Role:* Support Scientist (Project Leader: Paul Kucera)
- *Effort to date:* 3.6 months
- *Funding:* NOAA Hurricane Forecast Improvement Project – Ensemble RI Task
- *Goals:* (1) Develop and leverage global ensembles to better predict TC RI; (2) Prototype advanced visualizations of ensemble diagnostics.
- *Outcomes to date:* (1) mentored an Associate Scientist in setting up a stand-alone converter for the Statistical Hurricane Intensity Prediction Scheme (SHIPS) Development Dataset and to develop prototype visualizations of diagnostic outputs; (2) Implemented ensemble diagnostic visualizations in TCGP; (3) Leveraged the GRIP framework from my HFIP-funded project to create an ensemble-based GRIP framework that uses the rich information contained in the Global Ensemble Forecast System (GEFS) fields along with each ensemble member's underlying intensity forecast to come up with a probabilistic-to-deterministic intensity forecast; (4) the resulting information can provide a spatially-varying view of RI useful for diagnosing the factors supporting RI in the forecast situation.

**Past projects:***Advanced Climate and Regional Model Validation for Societal Applications (EaSM2) (May 2014 – Nov 2017)*

- *Role:* Support scientist, lead developer of the Climate Risk Management engine (CRMe, Project leader: Caspar Ammann)
- *Effort:* 3.7 months
- *Funding:* National Science Foundation
- *Goal:* Develop advanced tools for validation of climate and regional models for societal applications including multi-disciplinary application-oriented and process-oriented metrics.

- Outcomes: Developed CRMe, a highly extensible NCL-based platform for processing a wide variety of climate data for the purpose of evaluation and application-oriented uses (for more on CRMe's capabilities, see the description under the National Predictions & Projections Platform below). I also developed an innovative and intuitive web-based viewer interface to allow users to quickly drill down into the O(~100,000) plots and datasets that have been produced by CRMe.

*An Improved Historical Database for Tropical Cyclone Wind Risk Modeling (Sep 2013 – Jan 2016)*

- Role: Principal Investigator
- Effort: 11.3 months
- Budget: \$79,964
- Funding: Risk Prediction Initiative (RPI2.0), Bermuda Institute of Ocean Sciences (BIOS)
- Goal: Develop a new historical database of tropical cyclone wind and size parameters that is suited for wind risk modeling.
- Technical Description: This project is developing a new historical observations-based hurricane database for the purpose of supporting parametric wind risk modeling. Novel innovations of the new database include higher temporal and spatial resolution than existing databases, the use of objective methods to provide time-dependent error bounds on the estimated wind parameters, and the incorporation of alternative metrics for intensity and size. The aim is to provide the highest quality database possible for the parametric wind modeling applications used by (re)insurance industry to simulate wind risk from tropical cyclones.
- Outcomes: Built several source datasets, including the Enhanced Vortex Data Message (VDM+) Dataset and the Extended Flight Level (FLIGHT+) Dataset. The new historical database, which is called the Tropical Cyclone Observations-Based Structure Database (TC-OBS) was delivered Jan 2016 and will be publicly released in Nov 2016.
- Project resources:
  - Project website: <https://verif.rap.ucar.edu/tcdata/>

*National Climate Predictions & Projections Platform (NCP) (Apr 2013 – Aug 2015)*

- Role: Support scientist, lead developer for the NCP evaluation engine (Project leader: Caspar Ammann)
- Effort: 7.5 months
- Funding: NOAA
- Goal: Created an evaluation engine to compute various metrics and indices across a large set of downscaled regional climate data sets.
- Technical description: Designed a highly efficient and integrated workflow using an NCAR Command Language (NCL) code set to accomplish the following: (a) restructure each downscaled data set over the monthly, seasonal, and annual timescales; (b) compute base statistics for a variety of metrics and indices; (c) compute climatological period statistics; (d) and finally, generate a unique evaluation plot for each metric or index combination for the designated period time frame, along with an associated self-contained NetCDF data file and XML metadata file. Metrics computed include the mean, median, standard deviation, 5th, 10th, 25th, 75th, 90th, and 95th percentiles. Various groups of indices are also computed including

ETCCDI climate extremes indices, BioClim indices, and additional health-related indices. Comparison datasets are also generated to allow users to compare the various downscaled regional climate model data to several observational standards, which include the Maurer BCCA dataset and the Daymet 2.1 dataset. The processing can be accomplished on a local workstation or spread across many nodes of Yellowstone's visualization and data processing cluster. Altogether, 159,000 plots and datasets were created. The output datasets comply with Climate and Forecast (CF) conventions and support other applications such as open-climate GIS. The evaluation engine was eventually transformed into the Climate Risk Management engine (CRMe) and used in a variety of projects in CSAP.

*USDA Agriculture Project (Sep 2013 – Feb 2015)*

- Role: Support scientist, programmer (Project leader: Caspar Ammann)
- Effort to date: 1.4 months
- Funding: U.S. Department of Agriculture
- Goal: Implement computation of return periods, ensemble, and extreme value analysis techniques to examine the effects of changing climate on agriculture and food security.

*Development of an HWRF Diagnostics Module to Evaluate Intensity and Structure Using Synthetic Flight Paths Through Tropical Cyclones (Aug 2012 – Sep 2014)*

- Role: Principal Investigator
- Effort: 3.1 months
- Funding: Development Testbed Center Visitor Program
- Budget: \$35,929
- Project outcomes: 1) Developed a module to implement synthetic profiles in the Hurricane WRF (HWRF) model to diagnose wind structure in simulated HWRF storms. 2) The module conducts a direct comparison between radial legs of flight level wind speed observed in the actual storm and the synthetically-computed radial legs of wind speed from the HWRF model. 3) Results were analyzed for Hurricane Sandy (2012) and show that the synthetic profiles technique hold significant potential for advanced verification and applications for “guidance-on-guidance” for intensity and structure change.

*Large-scale Diagnostics of the Basin-scale HWRF Model (Jan – Aug 2012)*

- Role: Support scientist for the Development Testbed Center (DTC) Hurricane Task (Task lead: Ligia Bernardet (CIRES/NOAA))
- Effort: 8.0 months
- Project outcomes: 1) Worked to conduct large scale diagnostics of the basin-scale HWRF model (bHWRF) in a tera-scale computing environment. 2) Developed a custom workflow to compare a season of bHWRF simulations to corresponding 0-hr forecast fields of the NCEP Global Forecast System (GFS) model; 3) accumulated the spatial bias and error structures; 4) analyzed biases to try to understand if they could be tied to systematic model errors; 5) made recommendations on ways to improve the bHWRF model.

*Development Testbed Center Data Assimilation Task (Feb 2018 – May 2018)*

- Role: Support scientist
- Effort to date: 1.75 months

- Goal: Conduct verification of multiple model experiments to evaluate the impact of radial winds from NEXRAD radars on the High-Resolution Rapid Refresh (HRRR) model.
- Project outcomes: 1) Developed and applied verification workflows to evaluate the impact of radar winds for the HRRR model. 2) Compared surface and upper air observations to a version of HRRR which assimilated the radar data and compared to a baseline version that did not.

*International Finance Corporation (IFC) (Jan 2016 – present)*

- Role: Support scientist (Project leader: Caspar Ammann)
- Effort: 9.0 months
- Funding: International Finance Corporation
- Goal: Provide and provision hazard-specific climate input data for sectoral screening tools that will be used to screen potential IFC investment projects against the risk posed by changing climate.
- Outcomes: 1) I played an integral role in working with three different consulting teams to define climate variables and indicators for use in climate risk screening tools. 2) I developed codes to implement many of the indicators myself and integrated team member's contributions into the Climate Risk Management engine (CRMe). 3) New indicators include extreme value analysis indicators for precipitation, fire weather indicators, climate change indicators. 4) I also developed tropical cyclone wind risk indicators using TCRM. 5) I developed a novel method for delivering the climate risk data directly into Excel spreadsheets tailored for each consulting team. 6) Finally, I developed documentation and provided a high level of support to the consulting teams, assisting them in correct interpretation and use of the climate risk data.

*Climate Change Knowledge Portal (CCKP) (Jan 2015 – present)*

- Role: Support scientist, developer (Project leader: Caspar Ammann)
- Effort: 1.8 months
- Funding: World Bank
- Goal: Provide curated climate data for the World Bank Climate Change Knowledge Portal. Data include five 20-year time slices for 20 different CMIP5 models for 4 different representative climate pathways. Phase II expanded this by adding additional application-oriented indices and indicators for prototype dashboards that provide a succinct overview of the impacts of climate change for a given sector.
- Outcomes to date: Worked as part of a team to provide high quality GIS-enabled climate data on a rapid delivery schedule to populate the new CCKP web page.

*Be Secure Project for Water Security in the Philippines (Oct 2014 – present)*

- Role: Support scientist for training and research collaboration with the Philippines Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA)
- Effort to date: 2.3 months
- Funding: U.S. Agency for International Development (USAID)
- Goal: Build capacity to improve water security in the Philippines, assess tropical cyclone hazard in the Philippines, improve PAGASA's typhoon

modeling capabilities, conduct collaborative research for publication in peer-reviewed journals.

- Outcomes: 1) I was a key facilitator for a 2-day workshop to train PAGASA forecasters in the techniques of tropical cyclone forecasting (Nov 2014). 2) I assisted in an effort to evaluate and improve PAGASA's typhoon model. 3) I undertook an assessment of tropical cyclone wind hazard baselines under simplified future scenarios of climate change using the Australia Geoscience Tropical Cyclone Risk Model (TCRM).

Feb 2010 – Jan 2012 **Postdoctoral Fellow**, Advanced Study Program  
National Center for Atmospheric Research, Boulder, CO

*Research Foci:*

- Structure and intensity changes during hurricane eye formation
- Radius of maximum wind in tropical cyclones – controls and lifecycle
- An improved dataset for intensity and structure prediction

Aug 2000 – Jan 2010 **Graduate Research Assistant**, Schubert Research Group  
Department of Atmospheric Science, Colorado State University, Fort Collins, CO

*Ph.D. Research Focus: Hurricane eye formation* (see attached abstract)

Conducted original research on the structure and intensity changes which occur before, during, and after eye formation. Synthesized a new data set from Vortex Data Messages taken by aircraft reconnaissance, developed a new algorithm to filter these noisy data, and computed useful upper and lower bounds to determine the ranges and trends about the time of eye formation for intensity, radius of maximum wind, and other dynamic and thermodynamic parameters. Developed computer codes to implement a theoretical investigation of the conditions whereby a storm can rapidly develop a warm core. Conducted a review of eye formation in geophysical vortices.

*M.S. Research Focus: Tropical cyclone ensemble track prediction*

Used a multigrid barotropic track prediction model (MUDBAR) to develop and test a kilo-member ensemble method for track forecasting of Atlantic tropical cyclones. Implemented a real-time ensemble prediction system in a simulated operational environment. Conducted a sensitivity study of the influence of various model parameters on forecast performance. Developed an automated web page for viewing forecasts of the ensemble and other operational tropical cyclone forecast models.

Fall 2003 **Graduate Teaching Assistant**  
Department of Atmospheric Science, Colorado State University, Fort Collins, CO

*Course:* An Introduction to Atmospheric Modeling (AT604)

*Role:* Developed extensive solution sets to assigned homework including programming tasks, graded course assignments, provided useful feedback and suggestions to students.

Summer 2000 **Protégé, Significant Opportunities in Atmospheric Research and Science (SOARS)**  
Research Applications and Programs Division, NCAR, Boulder, CO  
*Science research mentor:* Kevin Petty, Ph.D.



*Research focus:* Applied a fuzzy logic/adaptive weighting statistical prediction scheme to the hurricane intensity for the Northeast Pacific Basin. Results were compared with standard linear regression method.

Summer 1999

**Protégé, Significant Opportunities in Atmospheric Research and Science (SOARS)**

Climate and Global Dynamics Division, NCAR, Boulder, CO

*Science research mentor:* Joel Norris, Ph.D.

*Research focus:* Compared predicted clouds in the Climate Community Model (CCM3) to remote sensing observations (ERBE, ISCCP, GPCP). Developed graphical visualization tools for qualitative comparison to diagnose errors in cloud parameterization.

1999-2000

**Undergraduate Teaching Assistant**

Department of Meteorology, Pennsylvania State University, State College, PA

*Course:* Introduction to Meteorology (for non-science major undergraduates)

*Role:* Taught a lab section (2 semesters), with an emphasis on physical and conceptual understanding of basic meteorological phenomenon. Gave weekly lectures, coursework, grading.

1997 – 1998

**High School Teacher**

Chuuk Seventh-day Adventist School, Chuuk State, Federated States of Micronesia

*Courses:* Physics, Pre-algebra, Algebra I & II, Geometry, Earth Science, Geography.

*Role:* Taught high school courses, assigned coursework, created tests, graded. Took part in various leadership activities and was instrumental in helping the high school achieve accreditation.

1996 – 1997

**Physics Tutor**

Southern Adventist University, Collegedale, TN

*Role:* Tutored college students in topics in General Physics, helping them develop a physical and intuitive understanding of physics.

## TRAINING ACTIVITIES

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Nov 18-19, 2014

Served as main facilitator for a 2-day workshop to train 31 tropical cyclone forecasters at PAGASA headquarters in Quezon City, Metro Manila, Philippines. Presented and adapted material used by the WMO Region IV tropical cyclone training workshops, with adaptations to make the material relevant to the Western Pacific basin. Covered topics of TC genesis, track and intensity forecasting, lifecycle and structure change, rainfall forecasting, use of microwave imagery to analyze TC structure, and verification.

## NUMERICAL WEATHER PREDICTION AND VERIFICATION EXPERIENCE

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### Relevant Coursework Beyond Core Required Graduate Classes in Atmospheric Science

- *Numerical Weather Prediction*
  - Atmospheric Modeling (Dr. David Randall, AT 604)
  - Numerical Weather Prediction (Dr. Wayne Schubert, AT 703)
  - Mesoscale Modeling (Dr. Roger Pielke Sr., AT 730)
- *Mesoscale Dynamics, Microphysics, and Boundary Layer*
  - Atmospheric Boundary Layer (Dr. David Randall, AT 623)
  - Cloud Microphysics (Dr. William Cotton, AT 724)
  - Mesoscale Dynamics (Dr. Richard Johnson, AT 735)
- *Tropical Cyclones and Related Phenomenon*
  - Meteorological Analysis and Forecasting (Dr. William Gray, AT 655)

- Atmospheric Waves and Vortices (Dr. Michael Montgomery, AT 707)
- Geophysical Vortices (Dr. Wayne Schubert, AT 710)
- *Statistics and Diagnostics*
  - Objective Analysis (Dr. David Thompson, AT 655)
  - Measurement Systems and Theory (AT 650)
- *Climate and General Circulation*
  - General Circulation (Dr. David Randall, AT 605)
  - Advanced General Circulation (Dr. David Randall, AT 745)
  - Global Carbon Cycle (Dr. Scott Denning, AT 760)
  - Climate Dynamics (Dr. Hank Dijkstra, AT 765)
- *Computer Programming*
  - Informal FORTRAN course on parallel programming practices, MPI, etc.

### Modeling and Verification Workshops and Tutorials Attended

Jan 31 – Feb 2, 2018	Model Evaluation Toolkit (MET, v6.1) Tutorial	Boulder, CO
Nov 8-10, 2011	HFIP Annual Review Meeting and HFIP Regional GSI-Hybrid Data Assimilation Workshop	Miami, FL
Feb 22, 2011	EMC/MMM/DTC Joint Hurricane Science Workshop	Boulder, CO
Feb 22-26, 2010	EMC/MMM/DTC Joint Hurricane Science Workshop and Joint WRF Tutorial for Hurricanes	Boulder, CO
Feb 7-10, 2006	WRF/NMM Tutorial	Boulder, CO
Oct 26-27, 2004	Hurricane WRF Workshop	Camp Springs, MD
Jun 22, 1999	4 <sup>th</sup> Annual CSM Workshop	Brekinridge, CO

### CAREER DEVELOPMENT ACTIVITIES

Sep 18-20, 2019	NCAR Python Tutorial	Boulder, CO
Apr – May 2018	Software Development on Amazon Web Services	Boulder, CO
Nov 1-2, 2011	NSF Communicating Science Workshop: “Becoming the Messenger”	Boulder, CO
May 24, 2010	EOD Training Workshop: “WE JUST DISAGREE: Personal Tools to Understand & Resolve Conflicts”	Boulder, CO
Apr 29, 2010	AAAS/NSF Workshop: “Communicating Science: Tools for Scientists and Engineers”	Boulder, CO
Apr 14, 2010	EOD workshop: “Organize Your Desk, E-mail and Time”	Boulder, CO

### COMPUTING SKILLS

**Operating Systems** Linux/UNIX, Microsoft Windows 7/8/10/11

**Programming Languages** NCAR Command Language (NCL)  
UNIX shell scripting  
Python  
FORTRAN 90/95/2003

**Version Control** Git, Subversion

**Data Analysis and Visualization** NCL, Microsoft Excel

**Document Preparation** LaTeX, Microsoft Word

**Other Activities** System administration of a personal Linux workstation/server (5 years)

## WEB DEVELOPMENT

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**Software Tools** Microsoft Expression Web 4, Adobe Photoshop CS3

**Web Languages** HTML5, CSS3, PHP, Javascript, AJAX, jQuery

2010 – present

**Tropical Cyclone Guidance Project**

<http://www.ral.ucar.edu/hurricanes/>

A high-profile NCAR web site to visualize operational tropical cyclone forecast aids and structure-based data. The site also includes an open, global repository of model guidance to encourage the development of new forecast aids for underserved tropical cyclone basins worldwide. RAL web developer Lara Ziady developed the overall site style and navigation template with my input. The site has received over four million hits since its initial release in August 2011.

2014 – present

**Tropical Cyclone Data Project**

<http://verif.ral.ucar.edu/tcdata/>

A web site for the provision of three research-quality tropical cyclone datasets and a new historical database. The web site features detailed data provenance for the datasets and provides an Export Control-compliant registration system.

2015 - present

**Climate Risk Management engine (CRMe) Viewer**

[https://verif.rap.ucar.edu/jntweb/crme/viewer/development\\_version/](https://verif.rap.ucar.edu/jntweb/crme/viewer/development_version/)

This web site provides a natural and intuitive touch-enabled interface to allow users to access a wide variety of CRMe datasets and output. Under the hood, AJAX and jQuery run client-side, allowing the user to seamlessly traverse the complex CRMe data directory structure. (NOTE: The CRMe Viewer works best with the Google Chrome and Mozilla Firefox browsers; may not work with the Safari or Internet Edge web browsers.)

## PROFESSIONAL AND ACADEMIC SERVICE

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World Meteorological Organization, World Weather Research Programme (WMO/WWRP) Typhoon Landfall Forecast Demonstration Project

- **Team Leader**, Implementation Team 1: Tropical Cyclone Data Collection and Sharing (2018 – present)
  - I lead TLFDP Team 1 in various activities to: 1) increase data collection sharing, 2) develop a concept for a multi-nodal data sharing network, 3) increase the use of probabilistic forecast data for real-time tropical cyclone wind hazards, and 4) develop a stakeholder survey on current use and understanding of TC forecast data.

World Meteorological Organization, Tropical Cyclone Programme

- 9<sup>th</sup> International Workshop on Tropical Cyclones (IWTC-IX), Honolulu, Hawaii, U.S., 2018
  - **Rapporteur**, Working Group for Topic 2.3: Intensity Change: Internal Influences
- 8<sup>th</sup> International Workshop on Tropical Cyclones (IWTC-VIII) and Tropical Cyclone Landfall Processes (IWTCLP-III), Jeju Island, South Korea, 2014
  - **Member**, Working Group for Topic 4.1: Structure Change Processes
  - **Member**, Working Group for Topic 4.3: Structure Change Forecasting

- **Participant**, contributed a draft recommendation to expand aircraft reconnaissance in the Western Pacific (this became one of the official IWTC recommendations); participated in break-out discussions
- 7<sup>th</sup> International Workshop on Tropical Cyclones (IWTC-VII), La Réunion, France, 2010
  - **Member**, Working Group for Topic 1.2: Structure and Intensity Change: Inner Core Impacts
  - **Participant**, contributed draft recommendations and participated in break-out discussions

#### Mesoscale & Microscale Meteorology Division, NCAR

- **Co-coordinator**, Dynamics Happy Hour (informal seminar series), 2010—2012
- **Coordinator**, Joint CSU/NOAA/NCAR Hurricane Workshop, 2011

#### University Corporation for Atmospheric Research

- **Member**, SOARS Steering Committee, 2004—2007

#### Research Applications Laboratory, NCAR

- **Initiator and Lead Developer** of the *Tropical Cyclone Guidance Project*, 2010 – present
  - Project aim: to provide a global, open-source repository for the collection and dissemination of real-time model products and aircraft-derived wind structure data
  - Phase I includes plots of track and intensity forecast aids for the North Atlantic, Northeast Pacific, and Central Pacific basins and real-time collections of Vortex Data Messages (released 14 August 2011).
  - Phase II expanded the repository to cover all global basins.
  - Phase III will add real-time visualizations of structure parameters.
  - Phase IV will feature an archive of retrospective plots for historical storms.
- **Member**, RAL Workload Management Committee, 2018-2019
  - The goal of this committee was to study the factors that lead to RAL staff feeling overloaded and come up with recommendations on how staff can better manage their workload.
  - A survey was taken and recommendations were made to RAL leadership which lead to the establishment of a follow-on committee.
- **Co-Chair**, RAL Staff Retention and Appreciation Committee, 2020 – present
  - The goal of this committee is to help staff feel more appreciated and improve retention of staff by improving RAL's workplace culture and any other negative factors that may be causing staff to leave.
  - The committee established the RAL Employee Appreciation Program (REAP) award, a monthly award to recognize and appreciate employees for non-achievement reasons.
  - The committee reviews staff nominations and votes each month.
  - The committee is also developing additional ways to recognize staff, such as through artwork.

#### Computational Information Systems Laboratory, NCAR

- **Contributor**, NCAR Command Language (NCL) Development Team, 2005 – 2018
  - Provided occasional NCL user support
  - Occasionally developed new visualization examples and discovered bugs

#### Colorado State University

- **Guest Lecturer**, yearly lectures on hurricane impacts for Marine Ecotourism course: 2006—2008
- **Presenter** on hurricanes to 5<sup>th</sup> graders for the Discovery Science Institute, 2008

#### American Meteorological Society

- **Referee**, Monthly Weather Review (2003, 2011-2013, 2016, 2021)
- **Referee**, Journal of Atmospheric Science (2010, 2012, 2014)
- **Referee**, Journal of Applied Meteorology and Climatology (2015)

- **Referee**, Bulletin of the American Meteorological Society (2016)
- **Max Eaton Student Prize Selection Committee**, 30<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology (April 2012)

Royal Society of Meteorology

- **Referee**, Quarterly Journal of the Royal Meteorological Society (2013)
- **Referee**, International Journal of Climatology (2017)

Springer Vienna

- **Referee**, Meteorology and Atmospheric Physics (2016)

National Science Foundation

- **Proposal Referee** (2012)

K-12 Educational Outreach

- **Vista Ridge Academy**, presented for the Pre-K Career Day (2022)
- **Discovery Science Institute**, presented on hurricanes to 5<sup>th</sup> graders (2006)

## HONORS AND AWARDS

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University Corporation for Atmospheric Research

- **UCAR Technical Achievement Award**, 2022
  - The METplus Earth System Model Verification and Diagnostics System
  - NCAR/RAL Team Members: Daniel Adriaansen, David Albo, Mrinal Biswas, Barbara Brown, Randy Bullock, Tatiana Burek, Hank Fisher, Eric Gilleland, Lisa Goodrich, John Halley Gotway, Michelle Harrold, Tracy Hertneky, Tara Jensen, Christina Kalb, Seth Linden, Will Mayfield, George McCabe, Kathryn Newman, John Opatz, Julie Prestopnik, Howard Soh, **Jonathan Vigh**, Minna Win-Gildenmeister, Jamie Wolff

Colorado State University

- **Shrake/Culler Graduate Engineering Fellowship**, *College of Engineering*, 2004

Significant Opportunities in Atmospheric Research and Science (SOARS) Program

- **Protégé**, 1999 and 2000
- **SOARS Graduate Fellowship support**, 2000—2002

American Meteorological Society

- **Guillermo Salazar-Rodriguez Undergraduate Scholarship**, 1999
- **Graduate Fellowship**, 2000

Pennsylvania State University

- **Distinguished Dean's List**, 1998—2000
- **Matthew J. Wilson Honors Scholarship**, *College of Earth and Mineral Sciences*, 1999
- **Chi Epsilon Pi (Meteorology) Honor Society**, 1999
- **John D. Dutton Award for Excellence in Atmospheric Dynamics**, Department of Meteorology, 2000

Southern Adventist University

- **President's Scholarship**, 1995
- **Distinguished Dean's List**, 1996—1997

## MENTORING AND ADVISING

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University of the South Pacific

- **Masters thesis committee**, Alick Haruhiru (advisor: Elisabeth Holland), 2013-2015
  - Served on the Masters thesis committee and co-hosted, along with James Done and Cindy Bruyère (NCAR/MMM), a student from the University of the South Pacific (USP) during a 9-month visit to NCAR. During Alick's visit, I spent considerable time mentoring him on his project, which was to examine statistical downscaling of General Circulation Models (GCMs) to understand past and future changes in tropical cyclone frequency and intensity in the South Pacific. During his stay, I taught him how to program in NCAR Command Language.

Graduate Student Visitor Program, Advanced Study Program, NCAR, Boulder, CO

- **Research host and collaborator**, Jonathan Lin (advisor: Prof. Kerry Emanuel), 2019
  - I served as the local research host for a graduate student visitor from the Massachusetts Institute of Technology (MIT) on a project to implement real-time probabilistic wind hazard predictions for tropical cyclones. During this 3-month visit, I mentored Mr. Lin as he worked on implementing his Forecasts of Hurricanes using Large-ensemble Outputs (FHLO) model in the Tropical Cyclone Guidance Project (TCGP). During his visit, Mr. Lin made numerous efficiency improvements.
- **Research host and collaborator**, Daria Schönemann (advisor Prof. Thomas Frisius), 2011
  - I served as the local research host for a graduate student visitor from Hamburg, Germany on a project to examine the fundamental controls on the radius of maximum wind in tropical cyclones. I organized this collaboration after a successful proposal to ASP's Graduate Visitor Program. Ms. Schönemann was here from August through December conducting runs with an axisymmetric hurricane model (HURMOD). Other NCAR collaborators include Dr. Richard Rotunno, Dr. George Bryan, and Dr. Brian Tang.

Significant Opportunities in Atmospheric Research and Science (SOARS) Program, NCAR, Boulder, CO

- **Science Research Co-Mentor**, Ivy MacDaniel, 2019
  - Jointly mentored Ms. MacDaniel, an undergraduate student at Austin Peay State University, on a project to validate and improve a logistic regression technique to predict tropical cyclone rapid intensification. Ms. MacDaniel evaluated a version of this technique run on predictors from the Hurricane Weather Research & Forecasting (HWRF) model. The resulting version was dubbed "HLOG" and performed competitively with other similar tools.
- **Science Research Co-Mentor**, Jonathan Martinez, 2014
  - Jointly mentored Mr. Martinez, a recent graduate from Florida State University, on a project to examine the relationship between intensity, intensification, and radial wind structure. Using the Extended Flight Level Dataset (FLIGHT+), Mr. Martinez computed composites of the radial wind structure for over 190 tropical cyclones (1999-2013) for various bins in an intensity-intensification rate phase diagram.
- **Science Research Co-mentor**, Diamilet Perez-Betancourt, 2010
  - Jointly mentored Diamilet, an undergraduate student from the University of Puerto Rico, on a project to examine environmental influence for cases of failed eye formation. Diamilet used my structure and intensity data set, the SHIPS development data set, and GPS dropsondes from the NOAA Gulfstream IV to examine the spatial and temporal variations of environmental vertical wind shear for storms which developed an eye structure, storms which failed to develop eyes, and storms which developed transient eyes.

## REFEREED PUBLICATIONS

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The number of citations to each paper is given according to Web of Science as of Nov 30, 2022.

17. Hendricks, E. A., **J. L. Vigh**, and C. M. Rozoff, 2021: Forced, balanced, axisymmetric shallow water model for understanding short-term tropical cyclone intensity and wind structure changes. *Atmosphere*, **12**(10), 1308, <https://doi.org/10.3390/atmos12101308>. [0 citations]
16. Brown, B., T. Jensen, J. H. 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, 2021: The Model Evaluation Tools (MET): More than a decade of community-supported forecast verification. *Bull. Atmos. Meteor. Soc.*, **102**(4), E782-E807, <https://doi.org/10.1175/BAMS-D-19-0093.1>. [12 citations]
15. Ruiz-Salcines, P., C. M. Appendini, P. Salles, W. Rey, **J. L. Vigh**, 2021: On the use of synthetic tropical cyclones and hypothetical events for storm surge assessment under climate change. *Nat. Hazards*, **105**, 431-459, <https://doi.org/10.1007/s11069-020-04318-9>. [2 citations]
14. Lin, J., K. Emanuel, and **J. L. Vigh**, 2020: Forecasts of hurricanes using large-ensemble outputs. *Wea. Forecast.*, **35**(5), 1713-1731, <https://doi.org/10.1175/WAF-D-19-0255.1>. [3 citations]
13. Izaguirre, I. J. Losado, C. P. Camus, **J. L. Vigh**, and V. Stenek, 2020: Climate change risk on global ports operations. *Nat. Clim. Chang.*, **11**, 14-20. <https://doi.org/10.1038/s41558-020-00937-z>. [40 citations]
12. Y. Ren, J. A. Zhang, **J. L. Vigh**, P. Zhu, H. Liu, X. Wang, J. B. Wadler, 2020: An observational study of the symmetric boundary layer structure and tropical cyclone intensity. *Atmosphere*, **11**, 158, <https://doi.org/10.3390/atmos11020158>. [6 citations]
11. Hendricks, E. A., S. A. Braun, **J. L. Vigh**, and J. B. Courtney, 2019: A summary of research advances on tropical cyclone intensity change from 2014-2018. *Trop. Cyclone Res. Rev.*, **8**(4), 219-225, <https://doi.org/10.6057/2019TCRR04.02>. [4 citations]
10. Stevenson, S. N., K. L. Corbosiero, M. DeMaria, and **J. L. Vigh**, 2018: A 10-year survey of tropical cyclone inner-core lightning bursts and their relationship to intensity change. *Wea. Forecasting*, **33**, 23-36, <https://doi.org/10.1175/WAF-D-17-0096.1>. [31 citations]
9. Martinez, J., M. M. Bell, **J. L. Vigh**, R. F. Rogers, 2017: Examination of Tropical Cyclone Structure and Intensification with the FLIGHT+ Dataset from 1999 to 2012. *Mon. Wea. Rev.*, **145**, 4401-4421, <https://doi.org/10.1175/MWR-D-17-0011.1>. [12 citations]
8. Guentchev, G. S., R. B. Rood, C. Ammann, J. B. Barsugli, K. Ebi, V. Berrocal, M. S. O'Neill, C. J. Gronlund, **J. Vigh**, B. Koziol, L. Cinquini, 2015: Evaluating the appropriateness of downscaled climate information for projecting risks of *Salmonella*. *Int. J. Environ. Res. Public Health*, **13**(3), 267, <https://doi.org/10.3390/ijerph13030267>. [8 citations]
7. Stern, D. P., **J. Vigh**, D. Nolan, and F. Zhang, 2015: Revisiting the relationship between eyewall contraction and intensification. *J. Atmos. Sci.*, **72**, 1283—1306, <https://doi.org/10.1175/JAS-D-14-0261.1>. [83 citations]

Correspondence arising (not peer-reviewed):

- Stern, D. P., **J. L. Vigh**, D. S. Nolan, and F. Zhang, 2017: Reply to "Comments on 'Revisiting the relationship between eyewall contraction and intensification'". *J. Atmos. Sci.*, 74, 4275-4286, <https://doi.org/10.1175/JAS-D-17-0120.1>. [3 citations]
6. Frisius, T., D. Schönemann, and **J. L. Vigh**, 2013: The impact of gradient wind imbalance on tropical cyclones in an unbalanced slab boundary layer model. *J. Atmos. Sci.*, **70**, 1874-1890, <https://doi.org/10.1175/JAS-D-12-0160.1>. [13 citations]
  5. Musgrave, K. D., R. K. Taft, **J. L. Vigh**, B. D. McNoldy, and W. H. Schubert, 2012: Time evolution of the intensity and size of tropical cyclones. *J. Adv. Model. Earth Syst.*, **4**, M08001, 15 pp, <https://doi.org/10.1029/2011MS000104>. [30 citations]
  4. **Vigh, J. L.**, J. A. Knaff, and W. H. Schubert, 2012: A climatology of hurricane eye formation. *Mon. Wea. Rev.*, **140**, 1405-1426, <https://doi.org/10.1175/MWR-D-11-00108.1> (with supplement). [39 citations]
  3. **Vigh, J. L.** and W. H. Schubert, 2009: Rapid development of the tropical cyclone warm core. *J. Atmos. Sci.*, 66, 3335-3350, <https://doi.org/10.1175/2009JAS3092.1>. [183 citations]
  2. Schubert, W. H., C. M. Rozoff, **J. L. Vigh**, B. D. McNoldy, and J. P. Kossin, 2007: On the distribution of subsidence in the hurricane eye. *Quart. J. Roy. Meteor. Soc.*, **133**, 595-605, <https://doi.org/10.1002/qj.49>. [63 citations]
  1. **Vigh, J.**, S. R. Fulton, M. DeMaria, and W. H. Schubert, 2003: Evaluation of a multigrid barotropic tropical cyclone track model. *Mon. Wea. Rev.*, **131**, 1629-1636, <https://doi.org/10.1175/2551.1>. [1 citation]

#### Current citation metrics as of Nov 2022:

##### Web of Science / ResearchID:

- *h*-index: 9
- Total citations: 523
- Number of citing articles: 435
- Average citations per article: 30.76
- Most cited article: "Rapid development of the tropical cyclone warm core" – 183 citations

##### Google Scholar (includes citations from conference papers and other "gray" literature):

- *h*-index: 11
- *i10*-index: 13
- Total citations: 842
- Most cited article: Rapid Development of the Tropical Cyclone Warm Core – 247 citations

##### ResearchGate:

- *h*-index: 12
- Total citations: 688
- ResearchGate Interest Score: 472.5



## DATASETS

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4. **Vigh, J. L.**, N. M. Dorst, C. L. Williams, D. P. Stern, E. W. Uhlhorn, B. W. Klotz, J. Martinez, H. E. Willoughby, F. D. Marks, Jr., D. R. Chavas, 2021: FLIGHT+: The Extended Flight Level Dataset for Tropical Cyclones (Version 1.3). Tropical Cyclone Data Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. [Available online at: <https://doi.org/10.5065/D6WS8R93>.]
3. **Vigh, J. L.**, E. Gilleland, C. L. Williams, D. R. Chavas, N. M. Dorst, 2018: TC-OBS: The Tropical Cyclone Observations-Based Structure Database (version 0.42, an alpha-level release). Tropical Cyclone Data Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. [Available online at: <https://doi.org/10.5065/D6BC3X95>.]
2. Chavas, D. R. and **J. L. Vigh**, 2015: QSCAT-R: The QuikSCAT Tropical Cyclone Radial Structure Dataset (Version 1.0). Tropical Cyclone Data Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. [Available online at: <https://doi.org/10.5065/D65B00J3>.]
1. **Vigh, J. L.**, 2015: VDM+: The Enhanced Vortex Data Message Dataset (Version 1.100). Tropical Cyclone Data Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. [Available online at: <https://doi.org/10.5065/D61Z42GH>.]

## PRODUCTS

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1. **Vigh, J. L.**, D. T. Hahn, D. J. Smith, J. Lin, A. Bol, D. O. Prevatt, D. B. Roueche, J. M. Collins, B. R. Ellingwood, G. Nain, J. E. Rovins, K. Emanuel, T. Ross-Lazarov, P. Mozumder, S. F. Pilkington, S. J. Weaver, G. Wong-Parodi, L. Myers, A. A. Merdjanoff, P. A. Kucera, C. Wang, T. Kloetzke, S. Joslyn, E. A. Holland, B. Brown, Y. P. Sheng, F. Tormos-Aponte, C. M. Appendini Albrechtsen, R. G. Goldhammer, H. Greatrex, M. Moulton, J. M. Done, E. A. Hendricks, C. M. Rozoff, and J. J. Alland, 2021: The HurricaneRiskCalculator® web app (version 2.5): Personalizing hurricane risk information by location and structural vulnerability. Weather Risk Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. [Available online at: <https://wxrisk.io>.]
2. **Vigh, J. L.**, C. M. Rozoff, E. A. Hendricks, D. Hahn, 2021: The Tropical Cyclone Guidance Project website (version 2.5): Real-time data and visualizations of tropical cyclone forecast guidance and observations. Tropical Cyclone Guidance Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. [Available online at: <https://hurricanes.ral.ucar.edu>.]

## NON-REFEREED PUBLICATIONS

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- Includes non-refereed pieces in journals, technical reports, and conference papers resulting in an extended abstract or poster.
25. Musgrave, K. D., P. A. Kucera, R. DeMaria, **J. L. Vigh**, T. L. Jensen, and B. C. Zachry, 2022: Conversion of model large-scale environmental diagnostics for tropical cyclones into the Model Environmental Tools - Tropical Cyclone (MET-TC) verification package. 35<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology, Joint Poster Session 1, New Orleans, LA, *Amer. Meteor. Soc.*, Poster 37.

24. Stern, D. P., J. D. Doyle, and **J. L. Vigh**, 2022: When does tropical cyclone rapid intensification begin? 35<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology, Joint Poster Session 2, New Orleans, LA, *Amer. Meteor. Soc.*, Poster 74.
23. **Vigh, J. L.**, D. T. Hahn, J. Lin, A. Bol, D. O. Prevat, D. B. Roueche, J. M. Collins, B. R. Ellingwood, G. Nain, J. E. Rovins, K. Emanuel, T. Ross-Lazarov, P. Mozumder, S. F. Pilkington, S. J. Weaver, G. Wong-Parodi, L. Myers, A. A. Merdjanoff, P. A. Kucera, C. Wang, T. Kloetzke, S. Joslyn, E. A. Holland, B. Brown, Y. P. Sheng, F. Tormos-Aponte, C. M. Appendini Albrechtsen, R. G. Goldhammer, H. Greatrex, M. Moulton, J. M. Done, E. A. Hendricks, C. M. Rozoff, J. J. Alland, M. Ge, C. Arthur, 2021: Updates on the Hurricane Risk Calculator: App capabilities, risk messaging, and pilot testing. Extended Abstract, 34<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, Session 9B Interdisciplinary research to improve the hurricane forecasting-warning-response system: Past, current, and future foci, virtual conference, *Amer. Meteor. Soc.*, Paper 9B.8. [[pdf](#)]
22. **Vigh, J. L.**, D. J. Smith, B. R. Ellingwood, J. Lin, D. O. Prevat, D. Roueche, B. G. Brown, D. T. Hahn, J. M. Collins, J. M. Done, G. Wong-Parodi, P. A. Kucera, C. Wang, J. J. Alland, T. Kloetzke, C. M. Rozoff, E. A. Hendricks, A. A. Merdjanoff, C. Arthur, M. Ge, Y. Peter Sheng, K. Emanuel, S. J. Weaver, J. Rovins, P. Mozumder, S. Joslyn, A. Bol, and T. Ross-Lazarov, 2020: The Hurricane Risk Calculator: Working toward Enhancing Our Nation's Readiness, Responsiveness, and Resilience to Hurricanes through Probabilistic Risk Frameworks for Evacuation Decision Support. Extended Abstract, *Eighth Symposium on Building a Weather-Ready Nation: Enhancing Our Nation's Readiness, Responsiveness, and Resilience to High Impact Weather Events*, Session 5 Hurricane Studies and Other Tropical Programmatic Achievements, Boston, MA, *Amer. Meteor. Soc.*, Paper 5.5. [[pdf](#)]
21. MacDaniel, I. C., C. M. Rozoff, **J. L. Vigh**, 2020: Application of Statistical Methods to Improving Model Predictions of Rapid Intensification in Tropical Cyclones, *Tropical Meteorology and Tropical Cyclones Symposium*. Boston, MA, *Amer. Meteor. Soc.*, Poster 861.
20. **Vigh, J. L.**, C. Arthur, J. Done, M. Ge, C. Wang, T. Kloetzke, C. M. Rozoff, B. Brown, and B. Ellingwood, 2018: The Hurricane Risk Calculator: Translating Potential Wind Impacts for Coastal and Inland Residents. Extended Abstract, 33<sup>rd</sup> Conf. on Hurricanes and Tropical Meteorology, Ponte Vedra Beach, FL, *Amer. Meteor. Soc.*, Poster 203. [[pdf](#)]
19. Emanuel, K., P. Caroff, S. Delgado, C. Guard, M. Guishard, C. Hennon, J. Knaff, K. R. Knapp, J. Kossin, C. Schreck, C. Velden, and **J. Vigh**, 2018: On the desirability and feasibility of a global reanalysis of tropical cyclones. *Bull. Amer. Meteor. Soc.*, 99, 427-429, [doi:10.1175/BAMS-D-17-0226.1](https://doi.org/10.1175/BAMS-D-17-0226.1).
18. **Vigh, J. L.**, C. A. Ammann, J. A. Lee, 2016: An Efficient Workflow Environment to Support the Collaborative Development of Actionable Climate Information Using the NCAR Climate Risk Management Engine (CRMe). Poster, *AGU Fall Meeting*, San Francisco, California, Amer. Geophys. Union, Poster A13I-0400, [doi:10.13140/RG.2.2.28381.82400](https://doi.org/10.13140/RG.2.2.28381.82400).
17. **Vigh, J. L.**, E. Gilleland, C. L. Williams, D. R. Chavas, N. M. Dorst, J. Done, G. Holland, and B. G. Brown, 2016: A New Historical Database of Tropical Cyclone Position, Intensity, and Size Parameters Optimized for Wind Risk Modeling. Extended Abstract, 32<sup>nd</sup> Conf. on Hurricanes and Tropical Meteorology, San Juan, Puerto Rico, *Amer. Meteor. Soc.*, Paper 12C.2, <http://dx.doi.org/10.13140/RG.2.1.3720.5361>.
16. **Vigh, J. L.**, 2015: VDM+: The Enhanced Vortex Data Message Dataset: Intensity, Structure, and Environmental Parameters from Atlantic Tropical Cyclones. NCAR Technical Note NCAR/TN-517+STR, 72 pp, [doi:10.5065/D6PR7T26](https://doi.org/10.5065/D6PR7T26).

15. Chavas, D.R., and **J. L. Vigh**, 2014: QSCAT-R: The QuikSCAT Tropical Cyclone Radial Structure Dataset. NCAR Technical Note NCAR/TN-513+STR, 25 pp, [doi:10.5065/D6J67DZ4](https://doi.org/10.5065/D6J67DZ4).
14. **Vigh, J. L.**, 2014: Development of an HWRF diagnostics module to diagnose intensity and structure using synthetic flight paths through tropical cyclones. Final report to the Development Testbed Center Visitor Program, 44 pp., Boulder, CO, [doi:10.13140/2.1.1587.9683](https://doi.org/10.13140/2.1.1587.9683).
13. **Vigh, J. L.**, C. Kieu, V. Tallapragada, L. R. Bernardet, and E. W. Uhlhorn, 2014: Use of Synthetic Profiles to Diagnose Simulated Tropical Cyclones in Regional Hurricane Models. Extended Abstract, *31<sup>st</sup> Conf. on Hurricanes and Tropical Meteorology*, San Diego, CA, *Amer. Meteor. Soc.*, Paper 16D.6.
12. **Vigh, J. L.**, and C. M. Rozoff, 2012: Impact of inner-core tropical cyclone structure on the potential for rapid intensification. Extended Abstract, *30<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Ponte Vedra Beach, FL, *Amer. Meteor. Soc.*, Paper 8B.2.
11. Stern, D., **J. L. Vigh**, D. S. Nolan, and F. Zhang, 2012: Revisiting the relationships between eyewall contraction and intensification. Poster, *30<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Ponte Vedra Beach, FL, *Amer. Meteor. Soc.*, P2.47.
10. Frisius, T., D. Schönemann, and **J. L. Vigh**, 2012: The impact of gradient wind imbalance on potential intensity of tropical cyclones. Poster, *30<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Ponte Vedra Beach, FL, *Amer. Meteor. Soc.*, P2.51.
9. Holland, G. J. and **J. L. Vigh**, 2011: Targeting as a mode of science communication: principles, issues, and a practical example. Poster, *AGU Fall Meeting*, Abstract ED33B-0786. [doi:10.13140/RG.2.2.10195.58403](https://doi.org/10.13140/RG.2.2.10195.58403).
8. **Vigh, J. L.**, 2010b: Structure and intensity changes during hurricane eye formation. Extended Abstract, *29<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Tucson, AZ, *Amer. Meteor. Soc.*, Paper 8B.1.
7. **Vigh, J. L.**, 2010a: Formation of the hurricane eye. *Ph.D. dissertation*, Colorado State University, 538 pp., Fort Collins, Colorado, 80523.
6. **Vigh, J. L.** and W. H. Schubert, 2008: The role of inertial stability in the rapid development of the tropical cyclone warm core. Extended Abstract, *28<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Orlando, FL, *Amer. Meteor. Soc.*, Paper 17C.1.
5. **Vigh, J.**, 2006: Formation of the hurricane eye. Extended Abstract, *27<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Monterey, CA, *Amer. Meteor. Soc.*, Paper 1B.6.
3. **Vigh, J.**, 2006: Hurricane eye formation remains unexplained. *Bull. Amer. Meteor. Soc.*, 87, 1314–1315.
3. **Vigh, J.**, 2004: Forecasting of Atlantic tropical cyclones using a kilo-member ensemble. *M.S. Thesis*, 180 pp., Dept. of Atmospheric Science, Colorado State University, Fort Collins, Colorado, 80523.
2. **Vigh, J.**, 2004: Evaluation of a kilo-member ensemble for track forecasting. Preprints, *26<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, Miami, FL, *Amer. Meteor. Soc.*, Paper 5C.7, 160–161.
1. **Vigh, J.**, 2002: Track forecasting of 2001 Atlantic tropical cyclones using a kilo-member ensemble. Preprints, *25<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology*, San Diego, CA, *Amer. Meteor. Soc.*, Paper 4D.1, 212–213.

## ORAL PRESENTATIONS

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Oral presentation, Vista Ridge Academy Pre-K Career Day

- Erie, Colorado 24 October 2022
- Title: Hurricane Scientist

Oral presentation (virtual), Front Range Tropical Cyclone Workshop

- Fort Collins, CO 28 September 2022
- Title: An ensemble-based statistical model for the prediction of rapid intensification at extended lead-times

Oral presentation, Unified Forecast System Hurricane Applications Team Meeting

- Virtual 17 August 2022
- Title: METplus updates: Integrating TC diagnostics into METplus

Oral presentation, Symposium on Hurricane Risk in a Changing Climate, American Association of Geographers

- Key Largo, Florida 06 June 2022
- Title: The HurricaneRiskCalculator® Web App: Enhancing public safety, resilience, and adaptation through actionable assessments of structure specific wind risks

Oral presentation, AMS 35th Conference on Hurricanes and Tropical Meteorology

- New Orleans, Louisiana 11 May 2022
- Title: Improving predictions of tropical cyclone rapid intensification through ensemble post processing

Oral presentation, WMO/WWRP Workshop: The Typhoon Landfall Forecast Demonstration Project (TLFDP)

- Virtual 07 March 2022
- Title: Typhoon Landfall Forecast Demonstration Project: Team 1: Tropical cyclone data collection and sharing

Oral presentation, MMM Weekly Chat, Mesoscale and Microscale Meteorology Laboratory, NCAR

- Virtual 17 February 2022
- Title: Observations on the Marshall Fire: A survivor's perspective

Oral presentation, NOAA/AOML/HRD Data Display, Archival, and Legacy Working Group

- Virtual 22 July 2021
- Title: VDM+, FLIGHT+, and TC-OBS: Data management of the NCAR Tropical Cyclone Data Project

Oral presentation, WMO Tropical Cyclone Probabilistic Forecast Products Workshop

- Virtual 15 June 2021
- Title: Day 1: Probabilistic forecast products

Oral presentation: AMS 34th Conference on Hurricanes and Tropical Meteorology

- Virtual 12 May 2021
- Title: Updates on the Hurricane Risk Calculator: App capabilities, risk messaging, and pilot testing

Oral presentation, AMS 34th Conference on Hurricanes and Tropical Meteorology

- Virtual 10 May 2021

- Title: A generalized rapid intensification prediction framework

Oral presentation, Hurricane Forecast Improvement Program (HFIP) Telecon

- Virtual 15 March 2021
- Title: An evaluation of FHLO using METplus

Oral presentation, WMO HiWeather Workshop

- Virtual 01 December 2020
- Title: The Hurricane Risk Calculator: Providing location-based wind risk outputs for residential structure damage and habitability

Oral presentation, WMO/WWRP Workshop: The Typhoon Landfall Forecast Demonstration Project (TLFDP)

- Virtual 24 November 2020
- Title: Typhoon Landfall Forecast Demonstration Project: Team 1: Tropical cyclone data collection and sharing

Oral presentation, Hurricane Forecast Improvement Program (HFIP) Annual Meeting

- Virtual 19 November 2020
- Title: New frameworks for predicting extreme rapid intensification

Poster, 2020 International Workshop on Verification Methods, WWRP/WGNE Joint Working Group on Forecast Verification Research

- Virtual 17 November 2020
- Title: Developing a space weather verification system using METplus

Oral presentation, 100<sup>th</sup> AMS Annual Meeting / Eighth Symposium on Building a Weather-Ready Nation: Enhancing Our Nation's Readiness, Responsiveness

- Boston, Massachusetts 15 January 2020
- Title: The Hurricane Risk Calculator: Working toward enhancing our nation's readiness, responsiveness, and resilience to hurricanes through probabilistic risk frameworks for evacuation decision support

Oral presentation, Distinguished Scientist Visit by Dr. Chun-Chieh Wu, NCAR

- Boulder, Colorado 04 December 2019
- Title: Tropical Cyclone Guidance Project and the Hurricane Risk Calculator

Oral presentation, Hurricane Forecast Improvement Program (HFIP) Annual Meeting

- Miami, Florida 04 November 2019
- New frameworks for predicting extreme rapid intensification

Oral presentation, WMO/WWRP Workshop: The Typhoon Landfall Forecast Demonstration Project, Nanjing University of Science and Technology

- Nanjing, China 05 September 2019
- Title: TLFDP Phase IV – Team 1: Progress and plans

Oral presentation, WMO/WWRP Workshop: The Typhoon Landfall Forecast Demonstration Project, Nanjing University of Science and Technology

- Nanjing, China 04 September 2019
- Title: New probabilistic frameworks for tropical cyclone forecasting and application to hazard communication

Oral presentation, U-Innovate Pitchfest, University Corporation for Atmospheric Research

- Boulder, Colorado 26 April 2019
- Title: Science-informed Climate Risk Portal

Oral presentation, Front Range Tropical Cyclone Workshop

- Boulder, Colorado 22 April 2019
- Title: New frameworks for predicting extreme rapid intensification

Oral presentation, Government Labs and Other Agencies Professional Development Workshop, Department of Atmospheric Science, Colorado State University

- Fort Collins, Colorado 10 April 2019
- Title: Careers at the National Center for Atmospheric Research (NCAR)

Oral presentation, RAL Thematic Internal Programmatic Review

- Boulder, Colorado 28 January 2019
- Title: Moving from hazard to risk: The Hurricane Risk Calculator

Oral presentation, WMO/TCP/WWW Ninth International Workshop on Tropical Cyclones (IWTC-9)

- Honolulu, Hawaii 04 December 2018
- Title: Topic 3.1 TC intensity change: Internal influences

Oral presentation, Front Range Tropical Cyclone Workshop

- Fort Collins, Colorado 28 November 2018
- Title: Overview of research developments in tropical cyclone intensity change: Internal processes (2014-2018)

Oral presentation, Shanghai Typhoon Institute, Chinese Meteorological Administration

- Shanghai, China 12 July 2018
- Title: Using flight level data to improve historical databases [[pdf](#)]

Oral presentation, WMO/WWRP Workshop: The Typhoon Landfall Forecast Demonstration Project (TLFDP)

- Shanghai, China 10 July 2018
- Title: Moving from hazard to risk: The Hurricane Risk Calculator [[pdf](#)]

Oral presentation, Shanghai Typhoon Institute

- Shanghai, China 09 July 2018
- Title: Moving from hazard to risk: The Hurricane Risk Calculator [[pdf](#)]

Oral presentation, Shanghai Typhoon Institute, Chinese Meteorological Administration

- Shanghai, China 09 July 2018
- Title: Overview of the Tropical Cyclone Guidance Project [[pdf](#)]

Oral presentation, Instituto de Ingeniería, Laboratorio de Ingeniería y Procesos Costeros, Universidad Nacional Autónoma de México (Engineering Institute, Laboratory of Engineering and Coastal Processes, National Autonomous University of Mexico)

- Sisal, Mexico 12 June 2018
- Title: Moving from hazard to risk: The Hurricane Risk Calculator [[pdf](#)]

**Seminar, Instituto de Ingeniería, Laboratorio de Ingeniería y Procesos Costeros, Universidad Nacional Autónoma de México (Engineering Institute, Laboratory of Engineering and Coastal Processes, National Autonomous University of Mexico)**

- Sisal, Mexico 11 June 2018
- Title: Tropical cyclone hazard assessment: Past, present, future [[pdf](#)]

Oral presentation, 33<sup>rd</sup> Conf. on Hurricanes and Tropical Meteorology

- Ponte Vedra Beach, Florida 19 April 2018
- Title: Exploring the upper bound of tropical cyclone intensification [[pdf](#)]

Oral presentation, Front Range Tropical Cyclone Workshop

- Boulder, Colorado 08 March 2018
- Title: A preliminary exploration of the upper bound of tropical cyclone intensification

Oral presentation, Workshop on Global Tropical Cyclone Reanalysis

- Asheville, North Carolina 22 May 2017
- Title: Use of objective methods for tropical cyclone state estimation

Oral presentation, Front Range Tropical Cyclone Workshop

- Fort Collins, Colorado 24 October 2016
- Title: The Tropical Cyclone Observations-Based Structure Database

Oral presentation, 32<sup>nd</sup> Conf. on Hurricanes and Tropical Meteorology

- San Juan, Puerto Rico 20 April 2016
- Title: A new historical database of tropical cyclone position, intensity, and size parameters optimized for wind risk modeling

Oral presentation, Risk Prediction Initiative Research Update Workshop

- Hamilton, Bermuda 26 September 2014
- Title: An improved historical database for tropical cyclone wind risk modeling

Oral presentation, 31<sup>st</sup> Conf. on Hurricanes and Tropical Meteorology

- San Diego, California 04 April 2014
- Title: Use of synthetic profiles to diagnose simulated tropical cyclones in regional hurricane models

Class lecture, Department of Atmospheric Sciences, National Taiwan University

- Taipei, Taiwan 20 February 2014
- Title: Atmospheric adjustment mechanisms and the rapid development of the tropical cyclone warm core

**Seminar, Department of Atmospheric Sciences, National Taiwan University**

- Taipei, Taiwan 20 February 2014
- Title: Tropical cyclone eye formation: Observations of structure and intensity change

Oral presentation, Joint CSU/NOAA/NCAR Hurricane Workshop on Tropical Cyclones, Boulder, CO

- Boulder, Colorado 08 January 2014
- Title: Steps toward an improved database for tropical cyclone wind risk modeling

Oral presentation, American Geophysical Union 2013 Fall Meeting

- San Francisco, California 09 December 2013
- Title: A computationally efficient platform to examine the efficacy of regional downscaling methods

Oral presentation, Risk Prediction Initiative Research Update Workshop

- Hamilton, Bermuda 12 October 2013

- Title: Development of an improved database of tropical cyclone size parameters

Oral presentation, 16<sup>th</sup> Cyclone Workshop

- Sainte-Adèle, Quebec, Canada 23 Sep 2013
- Title: Evaluation of the simulated structure of Hurricane Sandy using synthetic flight paths

Oral presentation, Joint CSU/NOAA/NCAR Hurricane Workshop on Tropical Cyclones

- Fort Collins, Colorado 16 May 2013
- Title: Progress toward the Extended Flight Level Dataset

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Boulder, Colorado 16 August 2012
- Title: Diagnosing spatial bias structure of the Basin Scale HWRf Model

Oral presentation, 30<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology

- Ponte Vedra Beach, Florida 16 April 2012
- Title: Impact of inner-core tropical cyclone structure on the potential for rapid intensification

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Fort Collins, Colorado 16 November 2011
- Title: How often does eye formation coincide with rapid intensification?

**Seminar, Meteorologisches Institut, Universität Hamburg**

- Hamburg, Germany 22 June 2011
- Title: A climatology of hurricane eye formation

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Boulder, Colorado 01 April 2011
- Title: A climatology of hurricane eye formation

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Fort Collins, Colorado 07 October 2010
- Title: Intensification and contraction: do they always go together?

Oral presentation, 29<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology

- Tucson, Arizona 12 May 2010
- Title: Structure and intensity changes during hurricane eye formation

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Fort Collins, Colorado 26 August 2009
- Title: Eye formation and warm rings

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Boulder, Colorado 25 February 2009
- Title: Towards a comprehensive structure and intensity dataset

Oral presentation, Joint CSU/NOAA/NCAR Workshop on Tropical Cyclones

- Fort Collins, Colorado 26 August 2008
- Title: An extended flight level dataset



Oral presentation, 28<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology

- Orlando, Florida 02 May 2008
- Title: Rapid development of the tropical cyclone warm core

Oral presentation, 27<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology

- Monterey, California 24 April 2006
- Title: Formation of the hurricane eye

Oral presentation, Colorado State University

- Fort Collins, Colorado 19 May 2006
- Title: Hurricanes and their impact on marine ecotourism

Oral presentation, 26<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology

- Miami, Florida 05 May 2004
- Title: Evaluation of a kilo member ensemble for track forecasting

Oral presentation, 25<sup>th</sup> Conf. on Hurricanes and Tropical Meteorology

- San Diego, California 30 April 2002
- Track forecasting of 2001 Atlantic tropical cyclones using a kilo-member ensemble

Oral Presentation, SOARS Colloquium

- Boulder, Colorado 07 August 2000
- Science Mentor: Kevin Petty
- A fuzzy logic system for predicting hurricane intensity in the eastern North Pacific

Oral Presentation, Native Society of Native American Studies Annual Meeting

- Houston, Texas 19 February 2000
- Co-panel member (lead: Thomas Windham)
- Title: Bridging two worlds: Native American students in science benefit from traditional knowledge, values, and practice

Oral Presentation, SOARS Colloquium

- Boulder, Colorado August 1999
- Science Mentor: Joel R. Norris
- Title: Diagnosing sources of error in the cloud parameterizations of the NCAR Climate Community Model

## **CURRENT FUNDING**

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*Forecaster Support Products for Analysis of Tropical Cyclone Intensity and Structure from Aircraft Reconnaissance Observations*

- Role: Principal Investigator
- Collaborating institutions: Colorado State University and University of Miami
- Funding source: NOAA Weather Program Office – Joint Hurricane Testbed (JHT)
- Funding opportunity title: FY2022 Weather Program Office Research Programs
- Funding opportunity number: NOAA-OAR-WPO-2022-2006969
- Award number: NA22OAR4590527
- Amount: \$748,584 (NCAR Budget: \$346,041)
- Date of award: 05 August 2022
- Performance period: 01 August 2022 – 31 July 2025

*Improving Access to NCAR's High Profile Hurricane Resources: Multi-language Support and Accessibility*

- Role: Principal Investigator
- Funding source: NCAR Education & Outreach Office (internal)
- Funding opportunity title: Diversity, Equity, and Inclusion Funding Opportunity
- Amount: \$20,000
- Date of award: 24 January 2022
- Performance period: 01 February 2022 - 31 January 2023

*New Frameworks for Predicting Extreme Rapid Intensification*

- Role: Co-Principal Investigator (NCAR PI; Dr. Kerry Emanuel, of the Massachusetts Institute of Technology - MIT, is overall PI)
- Funding source: NWS Office of Science and Technology Integration (OSTI) -- NOAA Hurricane Forecast Improvement Project (HFIP, via a subaward from MIT)
- Funding opportunity title: Round 3 of Research to Operations Initiative: NGGPS and HFIP
- Funding opportunity number: NOAA-NWS-NWSPO-2018-2005325
- Award Number: [NA18NWS4680058](#)
- Amount: \$339,571 (NCAR budget: \$222,922)
- Date of subaward: 07 October 2018
- Performance period: 01 September 2018 - 31 December 2022

**PAST FUNDING**

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*Strategic Development of a Cloud-Based Data Infrastructure for Hurricane Mobile Apps*

- Role: Principal Investigator
- Funding source: University Corporation for Atmospheric Research (UCAR) President's Strategic Initiative Fund (internal)
- Funding opportunity title: PSIF Scientific Research Award (FY2019)
- Amount: \$120,000
- Date of award: 03 June 2019
- Performance period: 06 June 2019 - 31 May 2020

*Development Toward a Real-Time Tropical Cyclone Risk Calculator*

- Role: Principal Investigator
- Funding source: RAL Opportunities Fund (internal)
- Amount: \$29,241
- Date of award: 05 May 2017
- Performance period: 1 June 2017 – 31 May 2018

*An Improved Historical Database for Tropical Cyclone Wind Risk Modeling*

- Role: Principal Investigator
- Funding source: Risk Prediction Initiative (RPI2.0), Bermuda Institute of Ocean Sciences (BIOS)
- Amount: \$79,964
- Date of award: 15 July 2013
- Performance period: 1 Oct 2013 – 31 Dec 2015

*Development of an HWRP diagnostics module to evaluate intensity and structure using synthetic flight paths through tropical cyclones*

- Role: Principal Investigator

- Funding source: Development Testbed Center Visitor Program
- Amount: \$35,929
- Date of award: 17 July 2012
- Performance period: 1 Aug 2012 – 31 Jul 2013

## PROFESSIONAL AFFILIATIONS

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2000 – present	<b>American Meteorological Society, Full Member as of 2011</b>
2001 – present	<b>American Geophysical Union</b>
2003 – 2004	<b>American Indian Science and Engineering Society</b>

## EXTERNAL LEADERSHIP ACTIVITIES

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2018 – 2021	Elders Board, <b>Denver South Seventh-day Adventist Church</b>
2014 – 2016	Lead, Community Council of Elders, <b>Boulder Seventh-day Adventist Church</b>
2001 – 2009	President, Treasurer, Secretary, <b>Adventist Christian Fellowship at Colorado State University</b> (CSU student organization)
2003 – 2009	Founder and owner of the <b>Fort Collins Trail Runners</b> Yahoo Group (1000+ members)
1998 – 2000	Participant and forecaster, <b>Campus Weather Service</b> , Pennsylvania State University

## HOBBIES, INTERESTS, AND EXTRACURRICULAR ACTIVITIES

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<b>Life experiences</b>	Survivor, Marshall Fire (30 Dec 2021). I lost my house in this catastrophic disaster, the most expensive wildfire in Colorado history (\$2 billion). As I was already working in the area of weather-driven risks and risk communication, going through the experience of a wildfire survivor has given me unique perspectives which I will apply for the rest of my career.
<b>Meteorology</b>	Tropical cyclones, downslope windstorms, extratropical storms, National Weather Service storm spotter, storm chasing, mountain meteorology, lake effect snowstorms, severe local storms.
<b>Mountaineering</b>	Climbed all 54 14,000-foot peaks in Colorado and 26 of the 50 U.S. State highpoints.
<b>Trail running</b>	Pikes Peak Marathon (5-time finisher), Wellsville Ridgewalk (1 <sup>st</sup> place overall in 2007, 2 <sup>nd</sup> place in 2008), Blue Sky Half Marathon (1 <sup>st</sup> place overall in 2008).
<b>Other sports</b>	Running, hiking, backpacking (West Coast Trail, British Columbia).
<b>Other activities</b>	Parenting, home improvement, church (teaching, ordained Elder), financial planning and investing, nature photography.
<b>Travel</b>	All 50 U.S. States and 40 other countries

## **ABSTRACT OF DISSERTATION**

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This dissertation consists of three distinct studies which investigate aspects of eye formation. The first study reviews eye phenomenon in a variety of vortices ranging from simple vortices to the menagerie of geophysical vortices, emphasizing similarities and differences to the eyes formed in hurricanes. The hurricane eye is found to be a paradoxical structure imposed by conservation of angular momentum and the boundaries of the vortex. A comprehensive definition for hurricane eye formation is proposed and various eye formation mechanisms are summarized.

The next study presents a simple theoretical argument to isolate the conditions under which a tropical cyclone can rapidly develop a warm-core thermal structure and subsequently approach a steady state. The theoretical argument is based on the balanced vortex model and, in particular, on the associated transverse circulation equation and the geopotential tendency equation. The transverse circulation and the temperature tendency in a tropical vortex depend not only on the diabatic forcing, but also on the spatial distributions of the static stability, the baroclinity, and the inertial stability. The vortex response to diabatic heating depends critically on whether the heating occurs in the low inertial stability region outside the radius of maximum wind or in the high inertial stability region inside the radius of maximum wind. This result suggests that rapid intensification is favored for storms which have at least some of the eyewall convection inside the radius of maximum wind. The development of an eye partially removes diabatic heating from the high inertial stability region of the storm center, yet rapid intensification may continue if the eyewall heating continues to become more efficient. As the warm core matures and static stability increases over the inner core, conditions there become less favorable for deep upright convection and the storm tends to approach a steady state.

The final study characterizes the kinematic and thermodynamic changes that occur before, during, and after the initial eye formations of a broad set of Atlantic tropical cyclones. To obtain the requisite structure and intensity parameters, a new data set has been synthesized from the Vortex Data Messages transmitted by routine aircraft reconnaissance from 1989-2008. Intensity ranges are determined for the times when the eye/eyewall structure first appears in aircraft radar and infrared satellite imagery. The mean intensity at which an eye is first observed in both aircraft or satellite imagery is found to be 58 kt, somewhat lower than reported in previous studies. Changes about the time of eye formation are examined for intensity, the radius of maximum winds, the minimum Rossby radius of deformation, eye temperature and dew point temperature depression. Storms are found to intensify most rapidly near the time of eye formation, especially when a persistent eye is observed in infrared satellite imagery. Many storms which are forming eyes are found to undergo a substantial and rapid contraction in the radius of maximum winds during the 24-h period before the eye is observed; once the eye is present, this contraction slows or ceases. Strong warming at lower levels (850 or 700 hPa) of the eye is not observed to correlate well with the time in which the eye is first observed. Finally, observations suggest that the dynamical heating efficiency of the resulting eyewall increases even as the physical scale of the efficient heating region decreases. This allows the storm to continue intensifying even though the total inner core diabatic heating may decrease. The answer to why some storms fail to form eyes may shed light on whether eye formation is a stochastic process involving constructive and destructive mesoscale interactions -- or whether it is a manifold attractor of the system sometimes stymied by an unfavorable environment.