

# Curriculum Vitae - Jacob D. Carstens

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## Professional Experience

- 9/2023-Present     **Consultant** - Supporting Florida Building Resilience Against Climate Effects ([FL BRACE](#)) Program. Continuation of 2021 work to publish a manuscript reviewing the effects of climate change on tropical cyclones, and interact with communities and public health officials to promote weather and climate literacy.
- 8/2022-Present     **Postdoctoral Scholar** - Department of Meteorology and Atmospheric Science, Pennsylvania State University. Mentored by Anthony Didlake, Jr. and Colin Zarzycki.
- 8/2017-7/2022     **Graduate Research Assistant** - Department of Earth, Ocean, and Atmospheric Science, Florida State University. (Graduate Teaching Assistant during the 2020-2021 academic year)
- 5/2021-8/2021     **Researcher** - Department of Geography, Florida State University. Supported FL BRACE Program, led by Christopher Uejio.

## Education

- 7/2022     **Ph.D.**, Florida State University, Meteorology.
- 5/2019     **M.S.**, Florida State University, Meteorology.
- 5/2017     **B.S.**, Florida State University, Meteorology.

## **Additional Research Training**

10/2015-5/2017     **Undergraduate Research Assistant** - Center for Ocean-Atmospheric Prediction Studies (COAPS). Responsible for quality control of research vessel sea surface temperature and wind data. Also produced an Honors thesis, advised by Vasu Misra.

## **Awards and Honors**

**Early Career Leadership Academy** - American Meteorological Society (2024)

**Max A. Eaton Student Prize** - Awarded for oral presentation at the 35<sup>th</sup> Conference on Hurricanes and Tropical Meteorology (2022)

**James and Sheila O'Brien Graduate Fellowship** - Florida State University Department of Earth, Ocean, and Atmospheric Science (2022)

**Student Travel Award** - Grant awarded for research presented at the 34<sup>th</sup> Conference on Hurricanes and Tropical Meteorology (2021)

**Best Lightning Talk** - Midwest Student Conference on Atmospheric Research (2020)

**Local Chapter of the Year** - American Meteorological Society (2020, President)

**Local Chapter Honor Roll** - American Meteorological Society (2017, Vice President)

**Orville Family Endowed Scholarship** - American Meteorological Society (2016)

**Member of the Year** - North Florida Chapter of the American Meteorological Society/National Weather Association (AMS/NWA, 2016)

## **Membership in Professional Organizations**

- American Geophysical Union
- American Meteorological Society
- Chi Epsilon Pi Meteorology Honor Society
- National Weather Association

## **Publications**

### Refereed Journal Articles

Carstens, J. D., & A. A. Wing (2023). Regimes of convective self-aggregation in convection-permitting beta-plane simulations. *J. Atmos. Sci.*, **80**, 2187–2205, doi:10.1175/JAS-D-22-0222.1.

Carstens, J. D., & A. A. Wing (2022). Simulating dropsondes to assess moist static energy variability in tropical cyclones. *Geophys. Res. Lett.*, **49**, e2022GL099101, doi:10.1029/2022GL099101.

Carstens, J. D., & A. A. Wing (2022). A spectrum of convective self-aggregation based on background rotation. *J. Adv. Model. Earth Syst.*, **14**, e2021MS002860, doi:10.1029/2021MS002860.

Carstens, J. D., & A. A. Wing (2020). Tropical cyclogenesis from self-aggregated convection in numerical simulations of rotating radiative-convective equilibrium. *J. Adv. Model. Earth Syst.*, **12**, e2019MS002020, doi:10.1029/2019MS002020.

### Journal Articles in Review, Revision, or Preparation

Carstens, J. D., A. C. Didlake, Jr., & C. M. Zarzycki. Tropical cyclone wind shear-relative asymmetry in reanalyses. *J. Climate*, in review.

Kopelman, M. V., A. A. Wing, & J. D. Carstens. Dropsonde-derived moist static energy variability in Atlantic hurricanes. *Geophys. Res. Lett.*, in prep.

Carstens, J. D., J. Jung, C. K. Uejio et al. Tropical cyclones and climate change: An overview for the public health community. *Public Health*, in prep.

Carstens, J. D., C. M. Zarzycki, A. C. Didlake, Jr., & C. A. Purdy. Tropical cyclone response to vertical wind shear under warming in a variable-resolution global climate model. *Geophys. Res. Lett.*, in prep.

### Theses and Other Articles

Carstens, J. D. (2022). The sensitivity of convective self-aggregation and tropical cyclogenesis to planetary rotation. [Dissertation at Florida State University](#).

Carstens, J. D., C. K. Uejio, & A. A. Wing (2021). Understanding past, present, and future tropical cyclone activity. [Available on Florida Climate Center website.](#)

Carstens, J. D. (2019). Tropical cyclogenesis from self-aggregated convection in numerical simulations of rotating radiative-convective equilibrium. [Master's thesis at Florida State University.](#)

Carstens, J. D. (2017). North Atlantic and Northeast Pacific tropical cyclone intensity comparison using integrated kinetic energy. [Undergraduate honors thesis at Florida State University.](#)

## **Grants**

### *Pending*

Didlake, Jr., A. C., C. M. Zarzycki, & J. D. Carstens. Asymmetric tropical cyclone processes in high-resolution climate models. Modeling, Analysis, Predictions, and Projections (MAPP), NOAA, \$570,000 requested for 3 years. (**Co-PI**)

## **Presentations**

### *Conference Presentations*

Carstens, J. D. (2024). Controls of rotation on convective self-aggregation onset. ePoster presentation at the 104<sup>th</sup> American Meteorological Society Annual Meeting, Baltimore, MD.

Carstens, J. D., A. C. Didlake, Jr., & C. M. Zarzycki (2024). Tropical cyclone asymmetry and wind shear interactions under global warming in a variable-resolution climate model. Oral presentation at the 104<sup>th</sup> American Meteorological Society Annual Meeting, Baltimore, MD. Poster presentation at the 36<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, Long Beach, CA.

Kopelman, M. V., A. A. Wing, & J. D. Carstens (2024). Dropsonde-derived moist static energy variability in Atlantic hurricanes. Oral presentation at the 104<sup>th</sup> American Meteorological Society Annual Meeting, Baltimore, MD. Poster presentation at the 36<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, Long Beach, CA.

- Purdy, C. A., J. D. Carstens, K. M. Nardi, B. S. Rojas, N. R. Barron, A. C. Didlake, Jr., & C. M. Zarzycki (2024). Asymmetric structure of tropical cyclones in the Community Atmosphere Model 5 (CAM5). Poster presentation at the 104<sup>th</sup> American Meteorological Society Annual Meeting, Baltimore, MD.
- Carstens, J. D., C. M. Zarzycki, & A. C. Didlake Jr. (2023). Asymmetric tropical cyclone structures and processes in reanalyses and climate models. Oral presentation at the American Meteorological Society 20<sup>th</sup> Conference on Mesoscale Processes, Madison, WI.
- Carstens, J. D., A. C. Didlake, Jr., & C. M. Zarzycki (2023). Asymmetric tropical cyclone structures and processes in reanalyses and climate models. Oral presentation at the 10<sup>th</sup> Northeast Tropical Workshop, Albany, NY.
- Carstens, J. D., A. C. Didlake, Jr., & C. M. Zarzycki (2023). Tropical cyclone shear-induced asymmetry in reanalyses and climate models. Oral presentation at the 103<sup>rd</sup> American Meteorological Society Annual Meeting, Denver, CO.
- Carstens, J. D., M. V. Kopelman, & A. A. Wing (2022). Tropical cyclone moist static energy structure in idealized simulations and dropsonde observations. Oral presentation at the American Geophysical Union Fall Meeting, Chicago, IL.
- Carstens, J. D., & A. A. Wing (2022). Regimes of convective self-aggregation in convection-permitting beta-plane simulations. Poster presentation at Tropical Cyclones, Convection, and Climate: A Symposium in Honor of Kerry Emanuel, Cambridge, MA.
- Kopelman, M. V., J. D. Carstens, A. A. Wing, M. E. O'Neill, J. P. Dunion, & D. R. Chavas (2022). Estimation of tropical cyclone moist static energy variability from dropsonde data. Oral presentation at the 35<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, New Orleans, LA.
- Carstens, J. D., & A. A. Wing (2022). Convective self-aggregation, equatorial waves, and tropical cyclones in idealized beta-plane simulations. Oral presentation at the 35<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, New Orleans, LA. (**Award Winner**)
- Carstens, J. D., & A. A. Wing (2022). Simulating dropsondes to assess moist static energy variability in tropical cyclones. Poster presentation at the 35<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, New Orleans, LA.

Carstens, J. D., M. V. Kopelman, & A. A. Wing (2021). Estimating moist static energy and surface enthalpy flux variance in a mature hurricane: Modeling and an observational case study. Virtual presentation at the 34<sup>th</sup> Conference on Hurricanes and Tropical Meteorology.

Carstens, J. D., & A. A. Wing (2021). Tropical cyclogenesis mechanisms in radiative-convective equilibrium simulations of varying rotation. Virtual presentation at the 34<sup>th</sup> Conference on Hurricanes and Tropical Meteorology.

Carstens, J. D., & A. A. Wing (2020). A spectrum for convective self-aggregation based on background rotation. Virtual presentation at the 4<sup>th</sup> Midwest Student Conference on Atmospheric Research. (**Award Winner**)

Carstens, J. D., & A. A. Wing (2020). Pathways to tropical cyclogenesis in rotating radiative-convective equilibrium simulations. Poster presentation at the 100<sup>th</sup> American Meteorological Society Annual Meeting, Boston, MA.

Carstens, J. D., & A. A. Wing (2019). Tropical cyclogenesis from self-aggregated convection in idealized numerical simulations: Sensitivity to planetary vorticity. Poster presentation at the 99<sup>th</sup> American Meteorological Society Annual Meeting, Phoenix, AZ.

Carstens, J. D., & V. Misra (2017). North Atlantic and East Pacific tropical cyclone intensity comparison with integrated kinetic energy. Poster presentation at the 97<sup>th</sup> American Meteorological Society Annual Meeting, Seattle, WA.

Carstens, J. D., S. R. Smith, M. A. Bourassa, & J. J. Rolph (2016). Examination of SAMOS sea temperature biases. Poster presentation at the Fourth International Workshop on the Advances in the Use of Historical Marine Climate Data (MARCDAT-IV), National Oceanography Centre, Southampton, UK.

### *Invited Seminars*

Carstens, J. D. (27 March 2024). Hurricane asymmetry in a warming climate: Capturing the mesoscale in global climate models. University of Louisiana at Monroe Atmospheric Science.

Carstens, J. D. (27 February 2024). New insights on hurricanes from emerging modeling and observational tools. University of North Dakota Atmospheric Sciences.

Carstens, J. D. (4 December 2023). Process-level understanding of hurricanes and tropical convection in models and observations. Salisbury University Geography and Geosciences.

Carstens, J. D. (31 March 2023). Organized tropical convection in idealized models, observations, and climate models. Mississippi State University Geosciences.

Carstens, J. D. (19 October 2022). Radiative-convective equilibrium and tropical deep convection. Penn State University Climate Dynamics.

Carstens, J. D. (26 August 2021, 12 April 2022, 18 November 2022, 4 December 2023, and 11 March 2024). Hurricanes and climate change. Presented as Florida BRACE webinar, at Florida A&M University's Energy Water Food Nexus, to University of Florida's Indian River Research and Education Center, at Salisbury University Department of Geography and Geosciences, and at Vermont State University Department of Natural Sciences. ([Link to recording](#))

Carstens, J. D. (21 January 2021). A spectrum for convective self-aggregation based on background rotation. Florida State University Meteorology.

### *Other Presentations*

Carstens, J. D. (2 April 2024). Climate change and extreme weather. WPSU Student Climate Day, Panel Discussion on Climate Science.

Carstens, J. D. (2020-2022). What goes into a hurricane forecast? City of Tallahassee Hurricane PREP Workshop.

Carstens, J. D. (24 April 2021). Tips for the atmospheric science graduate school experience. Northeastern Storm Conference.

Carstens, J. D. (21 January 2021). On the 2020 hurricane season... And enduring it as a TC-focused grad student. West Central Florida AMS Chapter Meeting.

### **Students Mentored**

**Chase Purdy** (Florida State University, B.S. 2024) – Penn State Climate Science REU. Project: Asymmetric Tropical Cyclone Structure in the Community Atmosphere Model (with Kyle Nardi, Bruno Rojas, Nicholas Barron, Anthony Didlake, and Colin Zarzycki).

**Michael Kopelman** (Florida State University, B.S. 2024) – FSU Undergraduate Research Opportunity Program. Project: A Climatology of Tropical Cyclone Moist Static Energy Derived from Dropsonde Observations (with Allison Wing).

**Cameron Chuss** (Penn State University, B.S. 2023) – Project: The Diurnal Cycle of Rainfall over Taiwan During the PRECIP Campaign (with Anthony Didlake).

## **Teaching**

**MET 2507 - Weather Analysis and Forecasting** (Spring 2021, **Instructor of Record**). Course description: An introduction to meteorological observations, data, codes, and scalar analysis practices. Weather applications software systems and computing environments for meteorological analysis and weather forecasting techniques are examined.

**MET 4301 - Atmospheric Dynamics I** (Fall 2020, **Teaching Assistant**). Course description: Atmospheric dynamics is the study of motion in the atmosphere. Understanding the basic nature of atmospheric flow is critical to understanding the origin and evolution of all weather and climate phenomena. In this course, students learn how to apply fundamental principles of mechanics and thermodynamics (e.g., conservation of momentum, mass, and energy) to derive a set of equations governing atmospheric flow. Students learn how to use these governing equations in order to gain insight into the basic nature of atmospheric flow, including the dynamics of vorticity and circulation.

**Graduate Course Guest Lectures** - METEO 597 (Tropical Meteorology, Fall 2022); METEO 521 (Dynamic Meteorology, Spring 2023)

**Undergraduate Course Guest Lectures** - METEO 005 (Severe and Unusual Weather, Summer and Fall 2023); METEO 422 (Advanced Atmospheric Dynamics, Fall 2023)

## **Service**

### Department Service

**Member** - Sustainability Green Team, Penn State Department of Meteorology and Atmospheric Science (2023-Present)

**Educator** - Weather Outreach and Education Club, Penn State Department of Meteorology and Atmospheric Science (2022-Present)



**Host, Hurricane Specialist, and Forecaster** - "Weather World" (2022-Present)

**Member** - Unlearning Racism in the Geosciences (URGE), Penn State Department of Meteorology and Atmospheric Science Committee on Belonging (2022-2023)

**President** - North Florida Chapter of the AMS/NWA (2019-2020)

**President** - Chi Epsilon Pi Meteorology Honor Society, FSU Chapter (2018-2020)

**Local Manager (FSU)** - WxChallenge National Forecasting Contest (2017-2022)

**Team Leader** - "FSU Weather" TV show (2016-2017). On air talent from 2015-2022.

**Vice President** - North Florida Chapter of the AMS/NWA (2016-2017)

#### University Service

**Poster Session and Outreach Chair** - Penn State 16<sup>th</sup> Postdoctoral Research Symposium Planning Committee (2023-Present)

**Chairperson** - Penn State Postdocs of EMS (PoEMS, 2022-Present)

**Mathematics, Physics, Environmental Science, and Meteorology Tutor** - FSU Student-Athlete Academic Services (SAAS, 2017-2019)

**Mathematics and Physics Tutor** - FSU Libraries (2015)

#### External Service

**Member** - AMS Board for Early Career Professionals (2023-2029, 2023 Secretary, 2024 Webinar Team Lead)

**Outreach Scientist** - Skype a Scientist (2022-Present)

**Outreach Scientist** - Scientist in Every Florida School (2020-Present)

**Member** - AMS Student Conference Planning Committee (2021-2023)

**Reviewer** - *Journal of the Atmospheric Sciences*, *Journal of Advances in Modeling Earth Systems*, *Geophysical Research Letters*, *Weather*, *Climate Dynamics*, *Atmospheric Science Letters*, *Monthly Weather Review*, *Journal of Geophysical Research - Atmospheres*

**Review Panelist** - NASA CYGNSS Science Team (2024)

**Session Chair** - 12<sup>th</sup> AMS Conference for Early Career Professionals (2024; Communication, Professionalism, and Best Practices When Using Social Media)

**Co-Chair** - Student Award Committee, 36<sup>th</sup> Conference on Hurricanes and Tropical Meteorology (2024)

**Session Chair** - 10<sup>th</sup> Northeast Tropical Workshop (2023; TC Intensity and Structure II)

### **Features in News Articles**

**The Associated Press** - "Misleading claims downplay climate change's effect on hurricanes". 6 October 2022. <https://apnews.com/article/fact-checking-307309528789>

**The Weather Channel** - "Watch: The 2020 hurricane season summed up in 76 seconds". 24 November 2020. <https://weather.com/storms/hurricane/video/the-2020-hurricane-season-summed-up-in-76-seconds>

**The Houston Chronicle** - "Watch 2020's record-breaking hurricane season unfold in 76 seconds". 23 November 2020. <https://www.chron.com/weather/article/Houston-hurricane-maps-forecast-2020-15748011.php>

**CBS** - "The record-shattering 2020 hurricane season, explained". 20 November 2020. <https://www.cbsnews.com/news/atlantic-hurricane-season-2020-record-breaking/>

**CNN** - "This relentless Atlantic hurricane season has put nearly every mile of coastline from Texas to Maine on alert". 13 November 2020. <https://www.cnn.com/2020/11/13/weather/2020-hurricane-season-records-texas-to-maine/index.html>

**Eos** - "Storms interact but rarely merge into bigger tempests". 26 August 2020. <https://eos.org/articles/storms-interact-but-rarely-merge-into-bigger-tempests>

**Forbes** - "2 tropical storms aren't going to merge into a megastorm - here's why". 22 August 2020. <https://www.forbes.com/sites/marshallshepherd/2020/08/22/2-tropical-storms-arent-going-to-merge-into-a-megastormheres-why/?sh=50f5cc74744d>

**Florida State University News** - "Hurricanes from scratch: FSU researchers find even small disturbances can trigger catastrophic storms". 13 May 2020.

<https://news.fsu.edu/news/science-technology/2020/05/13/hurricanes-from-scratch-fsu-researchers-find-even-small-disturbances-can-trigger-catastrophic-storms/>

**National Science Foundation Research News** - "Even small disturbances can trigger catastrophic hurricanes, researchers find". 19 May 2020.

[https://nsf.gov/discoveries/disc\\_summ.jsp?cntn\\_id=300610&org=GEO&from=news](https://nsf.gov/discoveries/disc_summ.jsp?cntn_id=300610&org=GEO&from=news)

**WCTV Tallahassee** - "Federal meteorologists unable to attend annual meeting due to shutdown". 11 January 2019. <https://www.wctv.tv/content/news/The-government-shutdown-had-a-ripple-effect-Federal-meteorologists-missed-out-on-large-annual-meeting-504239331.html>

**WCTV Tallahassee** - "FSU grad student attempting to solve the mystery of hurricane formation". 22 May 2020. <https://www.wctv.tv/content/news/FSU-grad-student-attempting-to-solve-the-mystery-of-hurricane-formation-570700901.html>

### **Other Media**

**Carolina Weather Group** - Episode on experiences of a meteorology student (2021). Available at <https://www.youtube.com/watch?v=Lcnb2YEBaUk&t=20s>

**American Meteorological Society** - Clear Skies Ahead Podcast, discussing responsibilities, challenges, and benefits of graduate school (2021). Available at [https://blubrry.com/clear\\_skies Ahead/81204574/jake-carstens-graduate-research-assistant-at-florida-state-university-in-tallahassee/](https://blubrry.com/clear_skies Ahead/81204574/jake-carstens-graduate-research-assistant-at-florida-state-university-in-tallahassee/)