# Aaron Hill

*Curriculum Vitae*

*Colorado State University*
*Department of Atmospheric Science*
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*Fort Collins, CO 80521*
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## ▬▬▬ Research Interests

Mesoscale meteorology, predictability and data assimilation, machine-learning applications, targeted observing, innovative observing systems, Python programming language

## ▬▬▬ Education

2019 **Ph.D., Geosciences**, *Texas Tech University*.
Advisors: Drs. Christopher Weiss and Brian Ancell
Dissertation: Demonstration of ensemble sensitivity-based targeted observing for convective-scale applications: Perfect-model experiments

2014 **M.S., Atmospheric Sciences**, *Texas Tech University*.
Advisors: Drs. Christopher Weiss and Brian Ancell
Thesis: Mesoscale data assimilation and ensemble sensitivity analysis towards improved predictability of dryline convection

2012 **B.S., Atmospheric Sciences**, *University of Washington*.
Advisor: Dr. Robert Houze, Jr.
Minor: Applied Mathematics

## ▬▬▬ Research Experience

2019-present **Postdoctoral Research Fellow**, *Colorado State University*.
Advisor: Dr. Russ Schumacher

2012 - 2019 **Graduate Research Assistant**, *Texas Tech University*.
Advisors: Drs. Chris Weiss and Brian Ancell

July - Sep 2018 **Graduate Student Visitor**, *Mesoscale and Microscale Meteorology Laboratory, National Center for Atmospheric Research*.
Sponsor: Dr. Glen Romine

2011-2012 **Undergraduate Research Assistant**, *University of Washington*.
Advisor: Dr. Robert Houze, Jr.

## ▬▬▬ Teaching Experience

### Instructor

Summer 2016 and 2017 ATMO 1300: Introduction to Atmospheric Science, Texas Tech University

### Guest Lecturer

**Texas Tech University**

2019 ATMO 3316: Severe and Hazardous Weather

2015 ATMO 1300: Introduction to Atmospheric Science

2014 ATMO 2301: Weather, Climate, and Human Activities

### Other

2020 **Co-Instructor:** Department of Atmospheric Science Machine Learning Workshop, Colorado State University

2017-2018, 2015 **Writing Tutor:** Graduate Student Writing Center, Texas Tech University

2015 **Guest Speaker:** 6th Grade Science Class, Tahoka Middle School, Tahoka, TX

# Publications

2019    **Hill, A. J.**, G. R. Herman, and R. S. Schumacher, 2019: Forecasting severe weather with random forests. Monthly Weather Review, submitted.

2016    **Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2016: Ensemble sensitivity analysis for mesoscale forecasts of dryline convection initiation. Monthly Weather Review, 144, 4161-4182. doi:10.1175/MWR-D-15-0338.1.

2014    Rasmussen, K. L., **A. J. Hill**, V. E. Toma, M. D. Zuluaga, P. J. Webster, and R. A. Houze, Jr., 2014: Multiscale analysis of three consecutive years of anomalous flooding in Pakistan. Quart. J. Roy. Meteor. Soc., 141, 1259-1276. doi:10.1002/qj.2433.

## In Preparation

2019    **Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2019: Factors influencing ensemble sensitivity-based targeted observing prediction at convection-allowing resolutions. In preparation for submission to Journal of Atmospheric Sciences.

2019    **Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2019: Convective-scale observation targeting and assimilation impacts on dryline forecasts. In preparation for submission to Weather and Forecasting.

2019    **Hill, A. J.**, C. C. Weiss, D. C. Dowell, and C. Alexander, 2019: Influence of a mobile mesoscale near-surface observing network on ensemble forecasts during VORTEX-SE. In preparation for submission to Weather and Forecasting.

# Presentations

\* upcoming

2020    \***Hill, A. J.** and R. S. Schumacher, 2020: Heavy precipitation and flash flood forecasts using random forests and convection-allowing models. 30th Conference on Weather and Forecasing / 26th Conference on Numerical Weather Prediction, Boston, MA., J71.2

     \***Hill, A. J.**, C. C. Weiss, and D. C. Dowell, 2020: Assimilating near-surface observations from a portable mesoscale network of StickNet platforms during VORTEX-SE with the High Resolution Rapid Refresh Ensemble. Severe Local Storms Symposium, Boston, MA., poster

     \***Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2020: Factors influencing ensemble sensitivity-based targeted observing predictions at convection-allowing resolutions. 24th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Boston, MA., 10.4

     \*McDonald, J. M., C. C. Weiss, and **A. J. Hill**, 2020: Properties of cold pools observed during the VORTEX-SE: Meso18-19 field campaign. Severe Local Storms Symposium, Boston, MA., poster

     \*Schumacher, R. S., **A. J. Hill**, G. R. Herman, M. Erickson, B. Albright, M. Klein, and J. A. Nelson Jr., 2020: If a flood falls in a (random) forest, does it get counted? Advances and challenges in predicting excessive precipitation using machine learning. 30th Conference on Weather and Forecasing / 26th Conference on Numerical Weather Prediction, Boston, MA., J71.3

2019    Ancell, B. C., A. A. Coleman, and **A. J. Hill**, 2019: Ensemble sensitivity-based subsetting overview and evaluation activities at the 2018 NOAA HWT. European Geophysical Union General Assembly 2019, Vienna, Austria, EGU2019-2435.

     Ancell, B. C., A. A. Coleman, and **A. J. Hill**, 2019: Ensemble sensitivity-based subsetting overview and evaluation activities at the 2018 NOAA HWT. 23rd Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Phoenix, AZ, paper 2.3A.

     Weiss, C. C., E. C. Bruning, J. Dahl, and **A. J. Hill**, 2019: Texas Tech VORTEX-SE Activities. VORTEX-SE Workshop, Huntsville, AL.

     Weiss, C. C., D. C. Dowell, N. Yussouf, and **A. J. Hill**, 2019: Insights into mesoscale and storm-scale predictability gained through ensemble sensitivity analysis. 23rd Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Phoenix, AZ, paper 20.1.

2018    Ancell, B. C., A. A. Coleman, and **A. J. Hill**, 2018: Ensemble sensitivity-based subsetting overview and evaluation activities at the 2018 NOAA HWT. American Geophysical Union Fall Meeting, Washington, D.C.

Ancell, B. C., A. A. Coleman, **A. J. Hill**, and C. C. Weiss, 2018: Ensemble sensitivity-based subsetting overview and evaluation activities at the 2018 NOAA HWT. 29th Conference on Severe Local Storms, Stowe, VT, paper 3A.4.

**Hill, A. J.**, 2018: (invited) The utility of ensemble-sensitivity analysis for targeted observing, ensemble subsetting, and investigating environmental controls on storm characteristics. Cooperative Institute for Research in the Atmosphere, Fort Collins, CO.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2018: Towards improving forecasts of severe convection along the dryline through targeted observing with ensemble sensitivity analysis. 29th Conference on Severe Local Storms, Stowe, VT, paper 14.2.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2018: Ensemble-sensitivity analysis based observation targeting experiments for mesoscale convection forecasts and factors influencing observation-impact prediction. 22nd Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Austin, TX, paper 613.

**Hill, A. J.**, C. C. Weiss, and D. C. Dowell, 2018: Exploring the utility of assimilating observations from a mesoscale network of StickNet platforms during VORTEX-SE with the High Resolution Rapid Refresh Ensemble. 29th Conference on Severe Local Storms, Stowe, VT, paper 74.

Weiss, C. C., D. C. Dowell, **A. J. Hill**, J. McDonald, E. C. Bruning, and J. Dahl, 2018: An update on VORTEX-SE activities at Texas Tech University. 29th Conference on Severe Local Storms, Stowe, VT, paper 3B.1.

Weiss, C. C., D. C. Dowell, **A. J. Hill**, and N. Yussouf, 2018: Ensemble sensitivity analysis of controls on storm-scale vertical vorticity for two southeastern U.S. tornado events. 22nd Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Austin, TX, paper 610.

2017  **Hill, A. J.**, C. C. Weiss, and B.C. Ancell, 2017: Ensemble-sensitivity analysis based observation targeting for mesoscale convection forecasts and factors influencing observation-impact prediction. American Geophysical Union Fall Meeting, New Orleans, LA, paper NG31A-0157.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2017: Ensemble sensitivity-based observation targeting experiments for Southern Plains dryline convection. 21st Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Seattle, WA, paper 15.5.

Kenyon, A. and **A. J. Hill**, 2017: Using Python to process and visualize real-time atmospheric data during VORTEX-SE. Scipy 2017: Scientific Computing with Python, Austin, TX.

Weiss, C. C., E. C. Bruning, J. Dahl, D. C. Dowell, C. R. Alexander, **A. J. Hill**, and V. C. Chmielewski, 2017: Preliminary results from the 2016 and 2017 VORTEX-SE project. 9th European Conference on Severe Storms, Pula, Croatia, paper ECSS2017-155.

Weiss, C. C, E. C. Bruning, J. Dahl, D. C. Dowell, C. R. Alexander, **A. J. Hill**, and V. C. Chmielewski, 2017: An overview of Texas Tech operations during VORTEX-SE 2016. Special Symposium on Severe Local Storms: Observation Needs to Advance Research, Prediction, and Communication, Seattle, WA, paper 939.

Weiss, C. C., D. C. Dowell, **A. J. Hill**, and N. Yussouf, 2017: Ensemble sensitivity analysis of controls on updraft rotation for two southeastern US tornado events. 21st Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Seattle, WA, paper 11.6.

2016  Ancell, B. C., **A. J. Hill**, and B. Burghardt, 2016: The TTU WRF ensemble prediction system. 2nd Ensemble Design Workshop for Convection Allowing Models, College Park, Maryland. MD.

Bruning, E. C., V. C. Chmielewski, C. C. Weiss, J. Dahl, **A. J. Hill**, C. J. Schultz, and J. Bailey, 2016: Flash size distributions characterized by mobile LMA deployments during VORTEX-SE. 28th Conference on Severe Local Storms, Portland, OR, paper 9.4.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2016: Ensemble sensitivity-based observation targeting experiments for Southern Plains dryline convection. 28th Conference on Severe Local Storms, Portland, OR, paper 7B.6.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2016: Ensemble sensitivity-based observation targeting OSSEs for Southern Plains dryline convection. 20th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, New Orleans, LA, paper J7.7.

Weiss, C. C, E. C. Bruning, J. Dahl, D. C. Dowell, C. R. Alexander, **A. J. Hill**, and V. C. Chmielewski, 2016: An overview of Texas Tech operations during VORTEX-SE 2016. 28th Conference on Severe Local Storms, Portland, OR, paper 3.5.

Weiss, C. C., D. C. Dowell, **A. J. Hill**, and N. Yossouf, 2016: Ensemble sensitivity analysis of controls on updraft rotation for the 27 April 2011 Tornado Outbreak. 28th Conference on Severe Local Storms, Portland, OR, paper 137.

2015    Ancell, B. C., **A. J. Hill**, and B. Burghardt, 2015: The use of ensemble-based sensitivity with observations to improve predictability of severe convective events. Preprints, 19th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Phoenix, AZ, paper 9.1.

Ancell, B. C., **A. J. Hill**, and B. Burghardt, 2015: The use of ensemble-based senstivity with observations to improve predictability of severe convective events. 27th Conference on Weather Analysis and Forecasting / 23rd Conference on Numerical Weather Prediction, Chicago, IL, paper 8B.5.

**Hill, A. J.**, B. Burghardt, and B. C. Ancell, 2015: Advanced ensemble techniques for improved predictability of storm-scale features. 1st Ensemble Design Workshop for Storm-Scale Ensembles, Boulder, CO.

**Hill, A. J.**, C. C. Weiss, and B.C. Ancell, 2015: Mesoscale ensemble sensitivity and observation targeting of dryline convection. Preprints, 19th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, Phoenix, AZ, paper 9.3.

2014    Ancell, B. C., **A. J. Hill**, and B. Burghardt, 2014: The use of ensemble-based sensitivity and observations to improve predictability of severe convective events. American Geophysical Union Fall Meeting, San Francisco, CA, NG31B-3798.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2014: Mesoscale ensemble sensitivity of dryline convective initiation. Preprints, 27th Conference on Severe Local Storms, Madison, WI, paper 8B.4.

**Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2014: Applicaiton of mesoscale ensemble-based sensitivity analysis to observation targeting. 26th Conference on Weather Analysis and Forecasting / 22nd Conference on Numerical Weather Prediction, Atlanta, GA, paper 610.

2013    **Hill, A. J.**, C. C. Weiss, and B. C. Ancell, 2013: Utilizing ensemble sensitivity for data denial experiments of the 4 April 2012 Dallas, Texas dryline-initiated convective outbreak using West Texas Mesonet observations and WRF-DART data assimilation. Preprints, 15th Conference on Mesoscale Processes, Portland, OR, paper 11.

Houze, R. A., Jr., K. L. Rasmussen, and **A. J. Hill**, 2013: TRMM insights into recent floods in Pakistan. PMM Science Team Meeting, Annapolis, MD.

Houze, R. A., Jr., K. L. Rasmussen, **A. J. Hill**, and M. D. Zuluaga, 2013: Using TRMM Precipitation Radar to understand the Pakistan and India floods of 2010-2012. American Geophysical Union Fall Meeting, San Francisco, CA.

## Funding

**Co-Principle Investigator** (PI: Brian Ancell, Co-PI Yonggang Wang): "Mesoscale Predictability Across Climate Regimes", National Science Foundation, $868,300, 3/1/20-2/28/23, PENDING

**Doctoral Dissertation Completion Fellowship**: one year of salary ($24,000), 9/1/18-8/31/19.

**Student Travel Award**: In recognition of an outstanding abstract for the 20th Conference on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface, $550, January 2017.

## Professional Leadership and Service

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| 2020 | **Associate Editor:** Monthly Weather Review |
| 2016-present | **Reviewer:** Weather and Forecasting, Monthly Weather Review, JGR-Atmospheres, Weather and Climate Dynamics, and Journal of Operational Meteorology |
| 2019-present | **Member:** AMS Scientific and Technological Activities Commission, Committee on Weather Analysis and Forecasting |
| 2019-present | **Member:** AMS 30th Conference on WAF/26th Conference on NWP Program Committee |
| 2019-present | **Participant:** Workshop: Increasing Inclusivity in the Engineering Classroom |
| 2013-2019 | **Team Manager and Participant:** WxChallenge Competition, Texas Tech University<br>Final-four finalist in 2017 End-of-Year Tournament |
| 2017-2018 | **Member:** AMS 29th Conference on WAF/25th Conference on NWP Program Committee |
| 2019 | **Participant:** Hydrometeorology Testbed (NOAA) Flash Flooding and Intense Rainfall Experiment |
| 2017-2018 | **Student Member:** Texas Tech University College of Arts and Sciences Committee on Academic Programs |
| | **Rapporteur:** 2017 NOAA R2O meeting and 2018 AMS Community Meeting |

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| 2014, 2018 | **Participant:** Hazardous Weather Testbed (NOAA) Spring Forecast Experiment |
| 2015-2016 | **Member:** 15th AMS Student Conference Planning Committee<br>Poster Session Subcommittee and Session Chair |
| 2014-2015 | **Member:** 14th AMS Student Conference Planning Committee |
| 2013-2015 | **Secretary:** American Meteorological Society Student Chapter, Texas Tech University |
| 2013, 2014 | **Reviewer:** Texas Tech University Undergraduate Research Conference |
| 2012-2013 | **President:** American Meteorological Society Student Chapter, Texas Tech University |
| 2011-2012 | **President:** American Meteorological Society Student Chapter, University of Washington |

## Fieldwork Participation

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| 2019 | Targeted Observations by Radars and UAS of Supercells (**TORUS**): Assisted fieldwork operations and led numerous forecast discussions. |
| 2013-2019 | Deploying mobile radars for interceptions of outflow boundaries, tornadoes, and mesoscale convective systems for the Texas Tech University Severe Storm Research Group. |
| 2018 | National Robotics Initiative: Assisted fieldwork operations with two mobile Ka-band radars to support unmanned aircraft flights in and around supercell thunderstorms. |
| 2017 | RIvers of VORticity in Supercells (**RiVorS**): Assisted fieldwork operations with a mobile Ka-band radar to observe vorticity rivers. |
| 2016-2017 | Verification of the Origins of Rotation in Tornadoes Experiment-Southeast (**VORTEX-SE**): Student technician responsible for: integrating solar panel hardware into the Texas Tech StickNet observing platforms, altering existing hardware and software, maintaining stationary observing sites, developing web display, and producing analysis graphics. |
| 2014-2015 | Air Force Office of Scientific Research (**AFOSR**) project: Assisted fieldwork operations with mobile Ka-band radars to adaptively sample baroclinic boundaries near supercells. Contributed to development of computer processing techniques and communications for real-time dual-doppler analyses. |
| 2013 | Assisted in the rebuilding of TTU StickNet data acquisition systems in support of the TTU Hurricane Research Team. |

## Honors and Awards

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| 2013 | **TTU Geoscience Scholarship**: Awarded to graduate students nominated by their respective department |
| 2012 | **Jurica Fellowship**: Awarded to new, incoming graduate students nominated by their prospective department |
| 2012 | **Atmospheric Sciences Achievement Award**: Graduating seniors in the Department of Atmospheric Sciences (Washington) who have achieved a GPA of 3.5 or higher in degree courses |
| 2012 | **Phil Church Award**: Graduating senior in the Department of Atmospheric Sciences (Washington) with the most outstanding record of scholarship, leadership, and service |
| 2010-2012 | **Naval Weather Service Association Scholar**: Proven academic achievement and student community leadership |

## Interviews

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| 9/24/18 | Daily Toreador newspaper regarding severe storm research in the Texas Tech Atmospheric Sciences Group |
| 2/24/17 | Texas Tech University Communications for the VORTEX-SE 2017 field program |
| 3/16/16 | Alabama Public Radio for Texas Tech involvement with the VORTEX-SE field program |
| 2/11/16 | Texas Tech University Climate Science Center Videos for Science series |
| 12/15 | Texas Living Magazine (online) regarding Texas weather |

## Memberships

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| 2017-present | American Geophysical Union |
| 2012-present | American Meteorological Society |

## Technical skills

\* indicates proficiency

Programming Languages: Python*, shell*, Fortran, NCL, LabVIEW, HTML/CSS/PHP
Meteorological Software: WRF*, DART*