Alexandra K. Anderson-Frey

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Research Interests

Exploring the intersection of machine learning, statistics, and atmospheric dynamics toward improved severe storms forecasting.

Education

Ph. D. in Meteorology, Penn State University **2017**
   Dissertation topic: "Statistical Examination of Tornado Report and Warning Near-Storm Environments"
   Advisor: Dr. Yvette P. Richardson
M. Sc. in Atmospheric Science, McGill University **2014**
   Thesis title: "Operational Mitigation of Ground Clutter Using Information from Past and Near-Future Radar Scans"
B. Sc. Honours in Atmospheric Science, University of Alberta **2010**
   Thesis title: "The Industrial Heat Island: One-Dimensional Simulations of Cloud Development over the Athabasca Oil Sands"

Research and Teaching Experience

- Assistant Professor, Department of Atmospheric Sciences, University of Washington — **2019—present**
- Postdoctoral Research Associate, Cooperative Institute for Mesoscale Meteorological Studies — **2018—2019**
- Postdoctoral Researcher, Penn State University — **2017—2018**
- Instructor, Introductory Meteorology (METEO 003), Penn State University — **2014**
- Graduate Research Assistant, Penn State University — **2012—2017**
- Graduate Teaching Assistant, McGill University — **2012**
- Graduate Research Assistant, McGill University — **2010—2013**
- Academy Intern, NASA Goddard Space Flight Center — **2011**
- Forecast Assistant, Prairie and Arctic Storm Prediction Center, Environment Canada — **2008—2010**
- Research Assistant, Hydrometeorology and Arctic Laboratory, Environment Canada — **2008—2010**
- Undergraduate Research Assistant, University of Alberta — **2007, 2010**

Students and Postdocs Advised (* = Primary Advisor)

*Kristan Lund, undergrad	Faculty Advisor	2020—present
*Noah Asch, undergrad	Faculty Advisor	2020—present
*Rohan Jain, M.Sc.	Faculty Advisor	2020—present
Alex Ochs, Ph.D.	GSR (Bioengineering)	2020—present
Robin Clancy, Ph.D.	Committee Member	2020—present
*Zhanxiang Hua, M.Sc.	Faculty Advisor	2019—present
Joseph Finlon, postdoc	Faculty Co-Advisor	2019—present
Clayton Sasaki, M.Sc.	Committee Member	2019—present
Jacqueline Nugent, M.Sc.	Committee Member	2019—present
Monte Flora, Ph.D.	Part-Time Research Supervisor	2018—2019

Journal Publications in Preparation

Hua, Z. and A. Anderson-Frey, 2021: Self-organizing maps for the classification of spatial and temporal variability of tornado-favorable parameters. *Mon. Wea. Rev.*, in prep.

Refereed Journal Publications

Anderson-Frey, A. and H. Brooks, 2021: Compared to what? Establishing environmental baselines for tornado warning skill. *Bull. Amer. Meteor. Soc*, in press.

Smith, B., R. Thompson, D. Speheger, A. Dean, C. Karstens, and A. Anderson-Frey, 2021: WSR-88D Tornado Intensity Estimates. Part II: Real-Time Applications to Tornado Warning Timescales. *Weather and Forecasting*, in press.

Smith, B., R. Thompson, D. Speheger, A. Dean, C. Karstens, and A. Anderson-Frey, 2020: WSR-88D Tornado Intensity Estimates. Part I: Real-Time Probabilities of Peak Tornado Wind Speeds. *Weather and Forecasting*, **35**, 2479-2492.

Anderson-Frey, A. and H. Brooks, 2019: Tornado Fatalities: An Environmental Perspective. *Weather and Forecasting*, **34**, 1999-2015.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2019: Characteristics of tornado events and warnings in the southeastern United States. *Weather and Forecasting*, **34**, 1017-1034.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2018: Near-storm environments of outbreak and isolated tornadoes. *Weather and Forecasting*, **33**, 1397-1412.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2017: Self-organizing maps: Probing spatial patterns in tornadic near-storm environments. *Weather and Forecasting*, **32**, 1467-1475.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2016: Investigation of tornado warning skill by environment. *Weather and Forecasting*, **31**, 1771-1790.

Markowski, P., Y. Richardson, M. Kumjian, A. Anderson-Frey, G. Jimenez, B. Katona, A. Klees, R. Schrom, and D. Tobin, 2015: Comments on "Observations of wall cloud formation in supercell thunderstorms during VORTEX2". *Monthly Weather Review,* **143**, 4278-4281.

Ansong, J., A. Anderson-Frey, and B. Sutherland, 2011: Turbulent fountains in one- and two-layer cross-flows. *Journal of Fluid Mechanics*, **689**, 254-278.

Conference Preprints, Selected Presentations, and Other Publications

Anderson-Frey, A. and H. Brooks, 2020: Compared to What? Establishing Environmental Baselines for Tornado Warning Skill. 30th Conference on Weather Analysis and Forecasting/26th Conference on Numerical Weather Prediction, Boston, MA.

Gallo, B., A. Anderson-Frey, and M. Flora, 2020: EnSOMble forecasting: Analyzing simulated supercell environments from convection-allowing models using self-organizing maps. 19th Conference on Artificial Intelligence for Environmental Science, Boston, MA.

Anderson-Frey, A. and H. Brooks, 2019: U.S. tornado fatalities: Environmental, seasonal, and geographical perspectives. 10th European Conference on Severe Storms, Krakow, Poland

Gallo, B., A. Anderson-Frey, and M. Flora, 2019: EnSOMble forecasting: Leveraging self-organizing maps for tornado threat modeling. 10th European Conference on Severe Storms, Krakow, Poland.

Anderson-Frey, A. and B. Gallo, 2019: EnSOMble forecasting: Leveraging self-organizing maps for tornado threat modeling. 19th Cyclone Workshop, Seeon, Bavaria, Germany.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2019: Tornado near-storm environments, warning skill, and fatalities in the southeastern United States. VORTEX-SE Workshop, Huntsville, AL.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2019: Self-organizing maps for tornadic near-storm environments of the southeastern United States. 18th Conference on Artificial and Computational Intelligence and its Applications to the Environmental Sciences, Phoenix, AZ.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2018: Tornadic near-storm environments of the southeastern United States. 29th Conference on Severe Local Storms, Stowe, VT.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2018: Self-organizing maps for tornadic near-storm environments. 17th Conference on Artificial and Computational Intelligence and its Applications to the Environmental Sciences, Austin, TX.

Markowski, P., Y. Richardson, A. Anderson-Frey, and B. Katona, 2017: An investigation of the effects of complex terrain on storm environments, near-surface wind profiles in and near storms, and tornado vulnerability in the southeastern U.S., using existing data and observations from the VORTEX-Southeast field campaign. VORTEX-SE Workshop, Huntsville, AL.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2017: The use of self-organizing maps to characterize the tornadic near-storm environment. 9th European Conference on Severe Storms, Pula, Croatia.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2016: Self-organizing maps: probing spatial patterns in tornadic near-storm environments. Preprints, 28th Conference on Severe Local Storms, Portland, OR.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2016: Self-organizing maps in the near-storm environment: Toward improving tornado forecasting. Preprints, 23rd Conference on Probability and Statistics in the Atmospheric Sciences, New Orleans, LA.

Anderson-Frey, A., Y. Richardson, A. Dean, R. Thompson, and B. Smith, 2014: Tornado environments, metrics, and warnings: Lessons from a ten-year climatology. 27th Conference on Severe Local Storms, Madison, WI.

Anderson-Frey, A. and F. Fabry, 2013: Operational mitigation of ground clutter using information from past and near-future radar scans. Preprints, 36th Conference on Radar Meteorology, Breckenridge, CO.

Anderson-Frey, A., Y. Richardson, A. Dean, 2012: Preliminary investigation of tornado warning skill by environment. Preprints, 26th Conference on Severe Local Storms, Nashville, TN.

Anderson-Frey, A. and F. Fabry, 2012: Rethinking radar product generation: Towards a better use of the time dimension in near-real time products. 46th CMOS-AMS Congress, Montreal, QC, Canada.

Anderson-Frey, A. and F. Fabry, 2011: Towards a better use of the time dimension and periodic revisits of near-real time data products. 35th Conference on Radar Meteorology, Pittsburgh, PA.

Anderson-Frey, A. and P. Campbell, 2011: The HyspIRI satellite mission: Assessing and monitoring ecosystem diversity and urban boundaries. Goddard Space Flight Center Summer Poster Session, Greenbelt, MD.

Anderson-Frey, A., 2009: Comparison of GEMLAM model output and point observations for the Baffin Island domain during the winter of 2008/09. Technical report, National Laboratory for Hydrometeorology and Arctic Meteorology, 65 pp.

Invited Talks and Seminars

ATMS Seminar, University of Illinois at Urbana-Campaign	2021

Funding and Contributions to Grant Proposals

PI, NOAA Shark Tank Research Grant		2018	$50,000
Contributor, VORTEX-SE Grant (Markowski/Richardson PIs)	NA17OAR4590189	2017	$178,716
Contributor, NOAA CSTAR Grant (Markowski/Richardson/Kumjian PIs)	NA14NWS4680015	2014	$375,000

Courses Taught (* = new course developed)

*ATM S 493A (UW): Methods of Atmospheric Data Analysis	**Sp20, A20**
ATM S 451 (UW): Instruments and Observations	**W20, W21**
METEO 003 (Penn State): Introductory Meteorology	**W14**

Service, Outreach, and Other Activities

• Co-Chair, AMS Conference on Probability and Statistics	**2022**
• Participant, UW PCC Climate and Environmental Justice Course Development Workshop	**2021**
• Associate Editor, Monthly Weather Review	**2020—present**
• Member, UW College of the Environment Scholarship Committee	**2020—present**
• Member, UW Atmos Committee on Graduate Studies	**2020—present**
• Session Chair/Judge, European Conference on Severe Storms	**2019**
• Member, AMS Planning Commission Task Force on DEI Information in AMS Databases	**2019—present**
• Member, AMS Board of Early Career Professionals	**2019—present**
• Steering Committee, AMS Early Career Leadership Academy	**2018—present**

- Member, AMS Scientific and Technological Activities Commission (STAC) Committee on Probability and Statistics **2017—present**
- Journal Peer Review: **2013—present**
  - *Nature*
  - *Atmosphere*
  - *Weather, Climate, and Society*
  - *NPJ Climate and Atmospheric Science*
  - *Journal of Climate*
  - *Electronic Journal of Severe Storms Meteorology*
  - *Geophysical Research Letters*
  - *Journal of the Atmospheric Sciences*
  - *Natural Hazards*
  - *Monthly Weather Review*
  - *Journal of Applied Meteorology and Climatology*
  - *International Journal of Disaster Risk Reduction*
  - *Weather and Forecasting*
- National Science Foundation Proposal Review Panelist **2018, 2019**
- Session Chair, AMS 29th Conference on Severe Local Storms **2018**
- Judge, Student Competition, AMS 29th Conference on Severe Local Storms **2018**
- Program Committee, AMS 29th Conference on Severe Local Storms **2018**
- Participant, AMS Early Career Leadership Academy **2018**
- Session Chair, AMS 25th Conference on Probability and Statistics **2018**
- Program Committee, AMS 28th Conference on Severe Local Storms **2016**
- Graduate Councilor, College of Earth and Mineral Sciences, Penn State University **2016—2017**
- Chair, Graduate Advisory Council, Penn State University **2014—2017**
- Chair, Society for Women in Meteorology, Penn State University **2013—2017**
- Participant, Hazardous Weather Testbed Experimental Forecast Program, Norman, OK **2013—2014**
- Student Volunteer, 46th CMOS-AMS Congress **2012**
- President, Council of Atmospheric and Oceanic Sciences, McGill University **2011—2012**
- Councilor, Council of Graduate and Postdoctoral Studies, McGill University **2010—2012**
- President, Atmospheric Science Student Group, University of Alberta **2009—2010**

Professional Society Membership

- American Association for the Advancement of Science (AAAS) **2017—present**
- American Geophysical Union (AGU) **2016—present**
- American Meteorological Society (AMS) **2012—present**
- Canadian Meteorological and Oceanographic Society (CMOS) **2008—present**

Selected Awards and Honors

- Research Associateship, National Research Council — **2018**
- Al and Betty Blackadar Graduate Scholarship in Meteorology, Penn State University — **2017**
- Postgraduate Scholarship, Natural Sciences and Engineering Research Council of Canada — **2012—2015**
- Anne C. Wilson Graduate Student Research Award, Penn State University — **2012—2013**
- Dr. Dennis W. and Joan S. Thomson Distinguished Graduate Fellowship, Penn State University — **2012—2013**
- John C. Mather Nobel Scholarship, NASA — **2011—2014**
- Space Learning Grant, Canadian Space Agency — **2011**
- Provost's Graduate Fellowship, McGill University — **2010—2012**
- Lorne Trottier Science Acceleration Fellowship, McGill University — **2010—2012**
- Alexander Graham Bell Canada Graduate Scholarship, Natural Sciences and Engineering Research Council of Canada — **2010—2012**
- Dean's Silver Medal in Science, University of Alberta — **2010**
- Atmospheric and Meteorological Undergraduate Research Awards, Environment Canada — **2007, 2010**
- Undergraduate Student Research Awards, Natural Sciences and Engineering Research Council of Canada — **2007, 2009, 2010**