

# Frances V. Davenport

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April 2023 – present    *Assistant Professor*, Dept of Civil and Environmental Engineering, Colorado State University  
2022 – 2023            *Postdoctoral Fellow*, Dept of Atmospheric Science, Colorado State University  
2017 – 2022            *Graduate Researcher*, Dept of Earth System Science, Stanford University  
2014 – 2017            *Civil Engineer I*, McLaughlin Water Engineers, Denver, CO

## Education

Ph.D.    **Stanford University**, Earth System Science, 3/2022  
B.E.     **Dartmouth College**, Thayer School of Engineering, Engineering, 3/2014  
B.A.     **Dartmouth College**, Engineering Sciences with High Honors, 6/2013

## Peer-Reviewed Publications

Google Scholar [profile](#)

12. **Davenport, F. V.**, E. A. Barnes, and E. M. Gordon (2024). Combining Neural Networks and CMIP6 Simulations to Learn Windows of Opportunity for Skillful Prediction of Multiyear Sea Surface Temperature Variability, *Geophysical Research Letters*, 51, e2023GL108099. <https://doi.org/10.1029/2023GL108099>
11. Gordon, E. M., E. A. Barnes and **F. V. Davenport** (2023). Separating internal and forced contributions to near term SST predictability in the CESM2-LE. *Environmental Research Letters*, 18(10), 104047. <https://doi.org/10.1088/1748-9326/acfdbc>
10. Trok, J. T., **F. V. Davenport**, E. A. Barnes and N. S. Diffenbaugh (2023). Using machine learning with partial dependence analysis to investigate coupling between soil moisture and near-surface temperature. *Journal of Geophysical Research: Atmospheres*, 128, e2022JD038365. <https://doi.org/10.1029/2022JD038365>
9. Ly, A., **F. V. Davenport** and N. S. Diffenbaugh (2023). Exploring the influence of summer temperature on human mobility during the COVID-19 pandemic in the San Francisco Bay area. *GeoHealth*, 7, e2022GH000772. <https://doi.org/10.1029/2022GH000772>
8. Yu, G., D. B. Wright, and **F. V. Davenport**, (2022). Diverse Physical Processes Drive Upper-Tail Flood Quantiles in the US Mountain West. *Geophysical Research Letters*, 49, e2022GL098855. <https://doi.org/10.1029/2022GL098855>
7. Diffenbaugh, N. S. and **F. V. Davenport** (2021). On the impossibility of extreme event thresholds in the absence of global warming. *Environmental Research Letters*, 16 (11). <https://doi.org/10.1088/1748-9326/ac2f1a>

6. Johnston, E. C., **F. V. Davenport**, L. Wang, J. K. Caers, S. Muthukrishnan, M. Burke, and N. S. Diffenbaugh (2021). Quantifying the effect of precipitation on landslide hazard in urbanized and non-urbanized areas. *Geophysical Research Letters*, 48, e2021GL094038. <https://doi.org/10.1029/2021GL094038>
5. **Davenport, F. V.** and N. S. Diffenbaugh (2021). Using machine learning to analyze physical causes of climate change: A case study of U.S. Midwest extreme precipitation. *Geophysical Research Letters*, 48, e2021GL093787. <https://doi.org/10.1029/2021GL093787>
4. Diffenbaugh, N. S., **F. V. Davenport**, and M. Burke (2021). Historical warming has increased U.S. crop insurance losses. *Environmental Research Letters*, 6(8). <https://doi.org/10.1088/1748-9326/ac1223>
3. Simpson, I. R., K. A. McKinnon, **F. V. Davenport**, M. Tingley, F. Lehner, A. A. Fahad, and D. Chen (2021). Emergent constraints on the large-scale atmospheric circulation and regional hydroclimate: do they still work in CMIP6 and how much can they actually constrain the future? *Journal of Climate*. <https://doi.org/10.1175/JCLI-D-21-0055.1>
2. **Davenport, F. V.**, M. Burke, and N. S. Diffenbaugh (2021). Contribution of historical precipitation change to US flood damages. *Proceedings of the National Academy of Sciences*, 118(4). <https://doi.org/10.1073/pnas.2017524118>
1. **Davenport, F. V.**, J. E. Herrera--Estrada, M. Burke, and N. S. Diffenbaugh (2020). Flood size increases nonlinearly across the western United States in response to lower snow--precipitation ratios. *Water Resources Research*, 56, e2019WR025571. <https://doi.org/10.1029/2019WR025571>

## Other Publications

### Reports

Technical contributor to Payton, E.A., A.O. Pinson, T. Asefa, L.E. Condon, L.-A.L. Dupigny-Giroux, B.L. Harding, J. Kiang, D.H. Lee, S.A. McAfee, J.M. Pflug, I. Rangwala, H.J. Tanana, and D.B. Wright, 2023: Ch. 4. Water. In: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH4>

### Articles

"Climate change is making flooding worse: 3 reasons the world is seeing more record-breaking deluges and flash floods", *The Conversation*, 2022

## Honors and Awards

- 2021 Department of Earth System Science Graduate Student Award for Research or Scholarly Achievement
- 2020 Neukermans Family Interdisciplinary Graduate Fellowship (3 years funding)
- 2020 ARCS Foundation Scholar Fellowship (declined)
- 2019 Travel Award, CMIP6 Hackathon, National Center for Atmospheric Research
- 2018 Travel Award, CESM Tutorial, National Center for Atmospheric Research

## Grants

### Internally Funded

09/2022 – 06/2025 Scott Foundation High-Impact Research Fund

*Remotely sensed global monitoring of human development amid climate hazards with a multi-year index of human footprint.* PI: Patrick Keys, Co-PIs: Frances Davenport, Elizabeth Barnes, Jim Hurrell.  
Award Amount: \$179,338

## Presentations

### *Invited Seminars*

- 2023 Dept of Atmospheric Science, Colorado State University (Fort Collins, CO)
- 2022 Dept of Atmospheric Science, University of North Dakota (*virtual*)
- 2022 Climate and Global Dynamics Seminar, National Center for Atmospheric Research (Boulder, CO)
- 2022 Dept of Atmospheric and Oceanic Sciences, UCLA (Los Angeles, CA)
- 2022 Dept of Atmospheric Science, University of Illinois, Urbana-Champaign (Champaign, IL)
- 2022 Dept of Atmospheric Science, University of Utah (Salt Lake City, UT)
- 2022 Dept of Civil and Environmental Engineering, Colorado State University (Fort Collins, CO)
- 2022 Dept of Civil and Environmental Engineering, Princeton University (*virtual*)
- 2022 Environmental Science and Engineering, California Institute of Technology (Pasadena, CA)
- 2022 Dept of Geography, University of Georgia (Athens, GA)
- 2022 Dept of Atmospheric, Oceanic, and Earth Sciences, George Mason University (Fairfax, VA)
- 2022 Center for Atmosphere Ocean Science, Courant Institute, NYU (*virtual*)
- 2022 School of Foreign Service, Georgetown University (*virtual*)
- 2021 Dept of Earth System Science, Stanford University (*virtual*)
- 2020 Yosemite Forum (Yosemite, CA, *virtual*)

### *Workshops and Conferences*

- 2024 Earth System Predictability Across Timescales Workshop, “Combining Neural Networks and CMIP6 Simulations to Learn Windows of Opportunity for Skillful Prediction of Multiyear Sea Surface Temperature Variability”, National Center for Atmospheric Research, Boulder, CO (poster)
- 2024 Chishiki-AI Research Summit, “AI for Climate-Related Hazards and Impacts”, University of Texas at Austin, (invited talk)
- 2024 Workshop on Confronting Earth System Model Trends with Observations: The Good, the Bad and the Ugly, “Assessing historical patterns of regional extreme precipitation change in observations and climate models using quantile regression and machine learning”, National Center for Atmospheric Research, Boulder, CO (poster)
- 2023 AGU Fall Meeting 2023, “Attributing damages from extreme climate events under historical and future climate pathways”, San Francisco, CA (invited talk)
- 2023 AMS Annual Meeting 2023, “Transfer Learning for Multi-year Climate Prediction”, Denver, CO (talk)
- 2022 AGU Fall Meeting 2022, “Combining Climate Models, Observations, and Deep Learning for Multi-year Climate Prediction”, Chicago, IL (talk)
- 2022 IMSI Economic Impacts of Climate Change Workshop, “Understanding the Costs of Flooding in a Changing Climate”, Chicago, IL (invited talk)
- 2021 AGU Fall Meeting 2021, “Using Machine Learning to Understand Changes in Extreme Precipitation”, New Orleans, LA, (talk)
- 2021 2nd Workshop on Knowledge Guided Machine Learning, “Using machine learning to analyze causes of increasing U.S. Midwest extreme precipitation”, virtual, (poster)
- 2020 AGU Fall Meeting 2020, “Understanding the Impacts of Climate Change on “Billion-dollar Disaster” Precipitation Events in the United States”, virtual, (talk)
- 2019 AGU Fall Meeting 2019, “Estimating the contribution of historical precipitation changes to increasing flooding damages in the United States”, San Francisco, CA, (talk)
- 2019 Lawrence Berkeley Workshop on Risk Analysis for Extremes in the Earth System, “Historical patterns of precipitation and flood damage in the U.S.”, Berkeley, CA, (poster)

- 2018 AGU Fall Meeting 2018, “Response of flood magnitude to changes in snow precipitation across the western United States”, Washington, D.C., (poster)
- 2018 Stanford School of Earth, Energy and Environmental Sciences Annual Research Review, “Quantifying the influence of snow on flood magnitude in the Western United States”, Stanford, CA, (poster)

## Teaching

### Colorado State University

*\*denotes an original course developed by Davenport for CSU students*

#### **CIVE 520: Physical Hydrology**

Graduate level course covering the fundamental physical processes that shape the movement and distribution of water within the earth system from local to regional to global scales. Offered Spring 2024.

#### **\*CIVE 480A6: Climate Change Risks and Impacts in Civil and Environmental Engineering**

Upper-level undergraduate course covering the scientific basis of climate change and how these changes impact different civil and environmental engineering systems. Students also develop climate data analysis skill using Python. Offered Fall 2024.

### Workshop Instructor

Software Carpentry, Stanford Libraries (2019-2021)

Instructor for R, Python, and Unix workshops teaching scientific computing skills to undergraduate, graduate, and postdoc researchers. Involved in both teaching and design of workshop materials.

### Pedagogical Training

Participant, Stanford Scientific Teaching Summer Institute, *Stanford University*, 7/2019

Participant, Software Carpentry Instructor Training, *Stanford University*, 10/2018

### Teaching Assistant

ESS 246A: Atmosphere, Ocean and Climate Dynamics: the Atmospheric Circulation, Stanford University (Fall 2019)

ENGS 21: Introduction to Engineering, Dartmouth College (2012-2014)

ENGS 25: Introduction to Thermodynamics, Dartmouth College (2013)

ENGS 20: Introduction to Scientific Computing, Dartmouth College (2012)

## Advising and Mentoring

### Current CSU PhD Students

Nicole Keeney (August 2023 – Present)

Michael Talbot (January 2024 – Present)

### Current Postdoctoral Mentees

Bryam Orihuela Pinto (July 2023 – Present), *co-advised with Pat Keys (CSU Atmospheric Science)*

### Previous Mentees

Madisyn Bietz (Spring 2023), CSU Scott Undergraduate Research Experience, *co-advised with Pat Keys*

## Media Outreach

Engagement with local and national media outlets on published research and issues related to climate change and extreme events. Coverage includes: *Washington Post*, *San Francisco Chronicle*, *Bloomberg*, *Reuters*, *ABC News*, *CBS News*, *CNBC*, *National Geographic*, *Scientific American*, *Yale Climate Connections*

*Selected coverage:*

New York Times, "[\*Climate change is making floods and landslides more likely, study finds\*](#)", 6/28/23

SF Chronicle, "[\*Floods have devastated parts of California. Here's why they're so hard to forecast\*](#)", 3/24/23

Boise State Public Radio, "[\*How climate change is feeding big floods around the Mountain West\*](#)", 7/19/22

Desert Research Institute, "[\*Study Explores Uncertainties in Flood Risk Estimates\*](#)", 6/14/22

Stanford News, "[\*Stanford researchers use artificial intelligence to unlock extreme weather mysteries\*](#)", 8/10/21

ABC News, "[\*1-in-100-year floods happening so often, the term may change\*](#)", 8/5/21

Stanford News, "[\*Global warming increased U.S. crop insurance losses by \\$27 billion in 27 years, Stanford study finds\*](#)", 8/4/21

Yale Climate Connections, "[\*Increases in extreme precipitation cost the U.S. \\$73 billion over three decades\*](#)", 5/18/21

CBS News, "[\*Climate change is responsible for billions of dollars in flood costs, study says\*](#)", 1/11/21

Stanford News, "[\*More rain and less snow means increased flood risk, Stanford study reveals\*](#)", 1/27/2020

## Service and Outreach

Associate Editor, *Journal of Climate*

Peer Reviewer: *PNAS*, *Water Resources Research*, *JGR: Atmospheres*, *Artificial Intelligence for the Earth Systems*, *Hydrology and Earth System Sciences*, *Journal of Hydrology*, *Climatic Change*

Organizing Committee Member, Women in Data Science @ Stanford Earth Conference, 2019

### K-12 Outreach

*Guest Speaker*, Eco Circle International (youth-led non-profit) fellowship program, 10/2021

*Guest Speaker*, Stanford Earth Young Investigators education program, 7/2021

## Professional Affiliations

member, American Geophysical Union (2018 - Present)

member, American Meteorological Society (2022 - Present)

member, Earth Science Women's Network (2019 - Present)

Last Updated July 10, 2024