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	*Doctoral Student 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*

14. Kalashnikov, D. A., **F. V. Davenport,** Z. M. Labe, P. C. Loikith, J. T. Abatzoglou, & D. Singh (2024). Predicting cloud-to-ground lightning in the western United States from the large-scale environment using explainable neural networks. *Journal of Geophysical Research: Atmospheres*, 129, e2024JD042147. https://doi.org/10.1029/2024JD042147

13. Trok, J. T., E. A. Barnes, **F. V. Davenport**, and N. S. Diffenbaugh (2024). Machine learning–based extreme event attribution, *Science Advances*, https://doi.org/10.1126/sciadv.adl3242.

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 ad 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

Grants

Internally Funded

07/2025 – 06/2026	School of Global and Environmental Sustainability Curriculum Innovation Grant *Integrating climate change, sustainability and resilience into civil and environmental engineering education.* PIs: Pinar Omur-Ozbek and Frances Davenport Award Amount: $10,000
11/2024	Borland Equipment Fund *Advancing hydrologic modeling capabilities through GPU-enabled deep learning* Award Amount: $15,000

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

2024   Physical Sciences Laboratory, National Oceanic and Atmospheric Administration (Boulder, CO)
2024   Dept of Civil and Environmental Engineering, University of Colorado Boulder (Boulder, CO)
2024   Dept of Geosciences, Colorado State University (Fort Collins, CO)
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   (**invited talk**) AGU Fall Meeting 2024, "Understanding recent trends in regional precipitation extremes: insights from multiple observational datasets and climate models", Washington, DC
2024   (**invited talk**) Workshop on Future Terrestrial Water Availability: Towards an Integrated Perspective on Water, Plants, and Climate, "Extreme Precipitation and Flooding", Aspen Global Change Institute, Aspen, CO
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   (**invited talk**) Chishiki-AI Research Summit, "AI for Climate-Related Hazards and Impacts", University of Texas at Austin,
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   (**invited talk**) AGU Fall Meeting 2023, "Attributing damages from extreme climate events under historical and future climate pathways", San Francisco, CA
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   (**invited talk**) IMSI Economic Impacts of Climate Change Workshop, "Understanding the Costs of Flooding in a Changing Climate", Chicago, IL
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.

Pedagogical Training

Stanford Scientific Teaching Summer Institute, *Stanford University*, 7/2019
Software Carpentry Instructor Training, *Stanford University*, 10/2018

Advising and Mentoring

Current CSU Graduate Students

Nicole Keeney (August 2023 – Present)
Michael Talbot (January 2024 – Present)
Bill Doan (August 2024 – Present)
Alexandria Rodgers (August 2024 – Present), *co-advised with Antonio Meira Neto*

Current Postdoctoral Mentees

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

Undergraduate Mentees

Brigid Neuheardt (Spring 2025), CSU Scott Undergraduate Research Experience
Rob Iliff (Spring 2025), CSU Scott Undergraduate Research Experience
Madisyn Bietz (Spring 2023), CSU Scott Undergraduate Research Experience, *co-advised with Pat Keys*

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 graduate 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

Service and Outreach

Department and University Service
Faculty Advisor, Water Science and Engineering Seminar Series (Spring – Fall 2025)
Member, Faculty Search Committee, Civil and Environmental Engineering (Fall 2024 – Spring 2025)

Professional Service
Associate Editor, *Journal of Climate*
Grant Referee for *National Oceanic and Atmospheric Administration (Climate Variability & Predictability)*
Journal Referee for *PNAS, Science Advances, Geophysical Research Letters, Water Resources Research, JGR: Atmospheres, Artificial Intelligence for the Earth Systems, Hydrology and Earth System Sciences, Earth's Future, Journal of Hydrology, Climatic Change*

Media Engagement
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:
Washington Post, *"Before the floods, Asheville was called a 'climate haven.' Is anywhere safe?"*, 10/01/24
National Geographic, *"Drought, flooding, drought again: Is 'weather whiplash' our new normal?"*, 9/18/24
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
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

Professional Affiliations

member, American Geophysical Union (2018 - Present)
member, American Meteorological Society (2022 - Present)
member, Earth Science Women's Network (2019 - Present)

Last Updated February 7, 2025