# David J. Farnham

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## Education

**2018** **Ph.D.**, *Columbia University*, New York, NY
Earth and Environmental Engineering Department

   **Adviser** Upmanu Lall, Columbia Water Center

   **Thesis** *Identifying and modeling spatio-temporal patterns in high dimensional climate and weather datasets with applications to water and energy resource management*

**2015** **M.S., Earth Resources Engineering**, *Columbia University*, New York, NY

   **Concentration** Water Resources and Climate Risks

   **Thesis** *Predictive Statistical Models Linking Antecedent Meteorological Conditions and Waterway Bacterial Contamination in Urban Waterways*

**2012** **B.S., Civil Engineering**, *SUNY-Buffalo*, Buffalo, NY
Summa Cum Laude, Honors College member

**2012** **B.A., Mathematics**, *SUNY-Buffalo*, Buffalo, NY
Summa Cum Laude, Honors College member

## Experience

### Research

**2018–Present** **Postdoctoral Research Scientist**, *Working with Dr. Ken Caldeira*, Carnegie Science & Department of Global Ecology, Stanford University, Stanford, CA

**2012–2018** **Graduate Student Researcher**, *Working with Dr. Upmanu Lall*, Columbia Water Center & Department of Earth and Environmental Engineering, Columbia University, New York, NY

**2012** **Student Researcher**, *Working with Dr. Joe Atkinson*, Department of Civil and Environmental Engineering, SUNY-Buffalo, Buffalo, NY

**2012** **Student Researcher**, *Ecosystem Restoration through Interdisciplinary Exchange, NSF IGERT REU*, SUNY-Buffalo, Buffalo, NY

### Teaching

**2015** **Teaching Assistant & Guest Lecturer**, *Environmental Data Analysis (Graduate level)*, Department of Earth and Environmental Engineering, Columbia University, New York, NY

**2015** **Teaching Assistant**, *Better Planet By Design (Undergraduate level)*, Department of Earth and Environmental Engineering, Columbia University, New York, NY

**2014–2016** **Lead Module Developer**, *HydroViz Web Modules: Teleconnections Module*, www.hydroviz.org

### Conference Organizing

**2019** **Chair & Convener**, *NH51A/NH53B: Emerging Needs and Approaches for Climate Services: Understanding and Developing Innovative Approaches to User-Oriented Climate Services*, American Geophysical Union Fall Meeting, San Francisco, CA

**2019** **Chair & Convener**, *H12B/H13J: Advances in Integrated Data Collection, Analyses, and Flood Modeling of Complex Urban Systems*, American Geophysical Union Fall Meeting, San Francisco, CA

### Student Advisement

2017–Present   Zeyu Xue, Jianan Cao, Bingquan Wu (master's students at Columbia University)
2016–2017      Caroline Schwab (high school student)

### Journal Reviewer

2017–Present   Climate Research, Geophysical Research Letters, Hydrology and Earth System Sciences, International Journal of Geographical Information Science, Science of the Total Environment, Water Research, and Water Resources Research

### Diversity, Equity, and Inclusion

2020–Present   **Coordinator**, *Facilitated weekly departmental working group discussions to spur initiatives to make the department a more welcoming and supportive environment, particularly for researchers and staff from underrepresented groups*

## Publications and Presentations

### Peer-reviewed Journal Articles Published, In Press, or Accepted

[1] Doss-Gollin, J., **Farnham, D. J.**, Ho, M., Lall, U., "Adaptation over Fatalism: Leveraging High-Impact Climate Disasters to Boost Societal Resilience". In: *Journal of Water Resources Planning and Management* 146.4 (Apr. 2020), p. 01820001. DOI: 10.1061/(ASCE)WR.1943-5452.0001190.

[2] Ruggles, T. H., **Farnham, D. J.**, Tong, D., Caldeira, K., "Developing reliable hourly electricity demand data through screening and imputation". In: *Scientific Data* 7.1 (2020), p. 155. DOI: 10.1038/s41597-020-0483-x.

[3] Zeng, P., Sun, X., **Farnham, D. J.,** "Skillful statistical models to predict seasonal wind speed and solar radiation in a Yangtze River estuary case study". In: *Scientific Reports* 10.1 (2020), p. 8597. DOI: 10.1038/s41598-020-65281-w.

[4] Doss-Gollin, J., **Farnham, D. J.**, Steinschneider, S., Lall, U., "Robust Adaptation to Multiscale Climate Variability". In: *Earth's Future* 7.7 (2019), pp. 734–747. DOI: 10.1029/2019EF001154.

[5] **Farnham, D. J.**, Doss-Gollin, J., Lall, U., "Regional Extreme Precipitation Events: Robust Inference From Credibly Simulated GCM Variables". In: *Water Resources Research* 54.6 (2018), pp. 3809–3824. DOI: 10.1002/2017WR021318.

[6] Hamidi, A., **Farnham, D. J.**, Khanbilvardi, R., "Uncertainty analysis of urban sewer system using spatial simulation of radar rainfall fields: New York City case study". In: *Stochastic Environmental Research and Risk Assessment* 32.8 (2018), pp. 2293–2308. DOI: 10.1007/s00477-018-1563-8.

[7] Cooper, C. B., Larson, L. R., Holland, K. K., Gibson, R. A., **Farnham, D. J.**, Hsueh, D. Y., Culligan, P. J., McGillis, W. R., "Contrasting the Views and Actions of Data Collectors and Data Consumers in a Volunteer Water Quality Monitoring Project: Implications for Project Design and Management". In: *Citizen Science: Theory and Practice* 2.1 (2017), pp. 1–14. DOI: 10.5334/cstp.82.

[8] **Farnham, D. J.**, Steinschneider, S., Lall, U., "Zonal Wind Indices to Reconstruct CONUS Winter Precipitation". In: *Geophysical Research Letters* 44.24 (Nov. 2017), pp. 12, 236–12, 243. DOI: 10.1002/2017GL075959.

[9] **Farnham, D. J.**, Gibson, R. A., Hsueh, D. Y., McGillis, W. R., Culligan, P. J., Zain, N., Buchanan, R., "Citizen science-based water quality monitoring: Constructing a large database to characterize the impacts of combined sewer overflow in New York City". In: *Science of The Total Environment* (2016). DOI: 10.1016/j.scitotenv.2016.11.116.

[10] **Farnham, D. J.**, Lall, U., "Predictive statistical models linking antecedent meteorological conditions and waterway bacterial contamination in urban waterways". In: *Water Research* 76 (2015), pp. 143–159. DOI: 10.1016/j.watres.2015.02.040.

### Articles In Review or Preparation

[1] Brown, P. T., **Farnham, D. J.**, Calderia, K., "Wind and Solar Droughts over western North America (submitted)".

[2] **Farnham, D. J.**, Caldeira, K., "Availability of solar and wind energy during extreme high heat events (in prep for ERL)".

[3] **Farnham, D. J.**, Duan, L., Caldeira, K., "Could a global interconnected energy grid be a greenhouse gas mitigation game changer? (in prep)".

[4] **Farnham, D. J.**, Lall, U., Kwon, H.-H., "Long-term Trends, Decadal Variability, and Teleconnections associated with Sub-weekly Precipitation Extremes from a Multicentury Record (in prep)".

[5] **Farnham, D. J.**, Lewis, N., Davis, S., Caldeira, K., "Constraining projections under deep uncertainty: the future of US electricity generation (in prep)".

[6] **Farnham, D. J.**, Modi, V., Lall, U., "Decadal scale climate variation presents risks and opportunities for managing wind/solar power supply (submitted)".

[7] HUI, Y., **Farnham, D. J.**, Atkinson, J., Zhu, Z., Feng, Y., "Validation of Three-dimensional Hydrodynamic Model for Circulation in a Large Lake using a Physical Model (in revision at *Journal of Hydraulic Engineering)*".

[8] Tong, D., **Farnham, D. J.**, Duan, L., Zhang, Q., Lewis, N., Caldeira, K., Davis, S., "Geophysical constraints on the reliability of solar and wind power worldwide (in review at *Nature*)".

[9] Yuan, S., **Farnham, D. J.**, Lall, U., Modi, V., "Simultaneous increasing electricity demand for heating and reliance on wind energy: Demand side management using heat pumps during extreme cold events (in minor revision at *Energy*)".

## Conference Presentations, Posters, and Non-peer-reviewed Papers

[1] Caldeira, K., **Farnham, D. J.**, Davis, S. J., Duan, L., Henry, C., Dowling, J. A., Lewis, N., Peer, R., Rinaldi, K., Ruggles, T., "A Simple Energy Modeling Framework for Transparent Investigation of Fundamental Energy System Properties". In: *AGU Fall Meeting 2019*. AGU. 2019.

[2] **Farnham, D. J.**, Caldeira, K., "Availability of solar and wind energy during extreme high heat events". In: *AGU Fall Meeting 2019*. AGU. 2019.

[3] **Farnham, D. J.**, Caldeira, K., Davis, S. J., Lewis, N., Duan, L., Henry, C., Ruggles, T., Peer, R., Dowling, J. A., Rinaldi, K., Tong, D., "The Macro Energy Model: Characterization and utility of an extremely simple energy model". In: *OpenMod workshop*. NREL. 2019.

[4] **Farnham, D. J.**, Davis, S. J., Lewis, N., Ruggles, T., Caldeira, K., "Constraining projections under deep uncertainty: the future of US electricity generation". In: *AGU Fall Meeting 2019*. AGU. 2019.

[5] Henry, C., DeCarolis, J., **Farnham, D. J.**, Ruggles, T., Queiroz, A., Eshraghi, H., Peer, R., Caldeira, K., "Generating a framework for inter-model comparisons in electricity dispatch modeling". In: *AGU Fall Meeting 2019*. AGU. 2019.

[6] Rinaldi, K., Duan, L., **Farnham, D. J.**, Ruggles, T., Caldeira, K., Lewis, N., "Evaluating a near-zero emissions electricity system for California with a simple energy model". In: *AGU Fall Meeting 2019*. AGU. 2019.

[7] Ruggles, T., Caldeira, K., Duan, L., **Farnham, D. J.**, Henry, C., Peer, R., "Electric Grid Reliability Implications for a Near-Zero Emissions Energy System". In: *AGU Fall Meeting 2019*. AGU. 2019.

[8] Tong, D., Caldeira, K., **Farnham, D. J.**, Duan, L., Lewis, N., Davis, S. J., "Geophysical constraints on the reliability of solar and wind electricity systems worldwide". In: *AGU Fall Meeting 2019*. AGU. 2019.

[9] Doss-Gollin, J., **Farnham, D. J.**, Steinschneider, S., Lall, U., "Robust Adaptation to Multi-Scale Climate Variability". In: *American Geophsyical Union Fall Meeting*. Washington, DC, Dec. 2018. DOI: 10.13140/RG.2.2.28447.20649.

[10] Faranda, D., Messori, G., Doss-Gollin, J., **Farnham, D. J.**, Lall, U., Yiou, P., "Dynamics and Thermodynamics of weather extremes: a dynamical systems approach". In: *European Geosciences Union General Assembly*. 2018.

[11] **Farnham, D. J.**, Lall, U., "Climate induced decadal variations in wind/solar energy generation potential and heating/cooling energy demand". In: *AGU Fall Meeting*. Washington, DC, 2018.

[12] Cao, J., **Farnham, D. J.**, Lall, U., "Spatial-temporal wind field prediction by Artificial Neural Networks". In: vol. abs/1712.05293. 2017. arXiv: 1712.05293.

[13] Doss-Gollin, J., **Farnham, D. J.**, Lall, U., "Designing and operating infrastructure for nonstationary flood risk management". In: *AGU Fall Meeting*. New Orleans, LA, 2017.

[14] Faranda, D., Messori, G., Doss-Gollin, J., **Farnham, D. J.**, Lall, U., Yiou, P., "Dynamics and Thermodynamics of weather extremes: a dynamical systems approach". In: *AGU FAll Meeting*. New Orleans, LA, 2017.

[15] **Farnham, D. J.**, Doss-Gollin, J., Lall, U., "Regional intense precipitation: inference from credibly simulated GCM variables". In: *North East Graduate Student Water Symposium*. Amherst, Mass, 2017.

[16] **Farnham, D. J.**, Steinschneider, S., Lall, U., "Zonal wind indices to reconstruct United States winter precipitation during El Ni\˜{n}o". In: *AGU Fall Meeting*. New Orleans, LA, 2017.

[17] Gawthrop, E., **Farnham, D. J.**, Fiondella, F., Owusu, A. S., Thomson, M., Ambani, M., Percy, F., Chung, W., McKeown, K., "Media Analysis: Communication of the 2015/16 El Niño in Kenya". In: *97th American Meterological Society Annual Meeting*. Seattle, WA, 2017.

[18] Doss-Gollin, J., **Farnham, D. J.**, Lall, U., "Global-Local Interactions Modulate Tropical Moisture Exports to the Ohio River Basin". In: *AGU Fall Meeting*. San Francisco, CA, 2016.

[19] **Farnham, D. J.**, Doss-Gollin, J., Lall, U., "Seasonal climate signals and synoptic circulation patterns associated with regional daily intense precipitation in the Ohio River Basin". In: *Workshop on Sub-Seasonal to Seasonal Predictability of Extreme Weather and Climate*. Columbia University, 2016.

[20] **Farnham, D. J.**, Doss-Gollin, J., Lall, U., "Space-time characteristics and statistical predictability of extreme sub-weekly precipitation events in the Ohio River Basin". In: *AGU Fall Meeting*. San Francisco, CA, 2016.

[21] Habib, E., Tarboton, D., Deshotel, M., **Farnham, D. J.,** "Development of Student-centered Modules to Support Active Learning in Hydrology". In: *ASEE Annual Conference & Exposition*. New Orleans, LA, 2016.

[22] Larson, L. R., Cooper, C. B., Krafte, K., Gibson, R., **Farnham, D. J.**, Hsueh, D., Culligan, P., Wade McGillis, "Characterizing citizen scientists based on project engagement: Data generators, data users, and "onlooker effects."" In: *Southeastern Recreation Research Conference*. Asheville, NC, 2016.

[23] **Farnham, D. J.**, Habib, E., Lall, U., "HydroViz: A Web-based Climate Teleconnection Module for Undergraduate and Graduate Water Engineering Students". In: *AGU Fall Meeting*. San Francisco, CA, 2015.

[24] **Farnham, D. J.**, Lall, U., Kwon, H.-H., Doss-Gollin, J., "Moisture Transport and Extreme Precipitation in Mid-latitudes". In: *AGU Fall Meeting*. San Francisco, CA, 2015.

[25] Habib, E., Bodin, M., Taboton, D., Merck, M., **Farnham, D. J.,** "Stimulating Active Learning in Hydrology Using Research-Driven, Web-based Learning Modules". In: *ASEE Annual Conference & Exposition*. Seattle, WA, 2015.

[26] Hsueh, D. Y., **Farnham, D. J.**, Gibson, R. A., McGillis, W. R., Zheng, Y., Buchanan, R., Eddowes, D., Zain, N., Loiselle, S., Butkiewicz, L., "NYC URBAN WATER QUALITY: MONITORING THE FLOW OF CSOS WITH CITIZEN SCIENTISTS". In: *Aquatic Sciences Meeting*. Granada, Spain, 2015.

[27] Hsueh, D., **Farnham, D. J.**, Gibson, R., McGillis, W. R., Culligan, P. J., Cooper, C., Larson, L., Mailloux, B. J., Buchanan, R., Borus, N., Zain, N., Eddowes, D., Butkiewicz, L., Loiselle12, S. A., "Advancing the Potential of Citizen Science for Urban Water Quality Monitoring: Exploring Research Design and Methodology in New York City". In: *AGU Fall Meeting*. San Francisco, CA, 2015.

[28] **Farnham, D. J.**, Atkinson, J. F., "Flow visualization study: Understanding water circulation in Lake Ontario through physical modeling". In: *The 22nd Annual Great Lakes Research Consortium Student-Faculty Conference*. Oswego, NY, 2012.

## Invited Presentations

[1] *Bronx Sewershed Water Quality and Citizen Science (with W. McGillis and D. Hsueh)*. Interdisciplinary Workshop on Urban Green Infrastructure: Reports on Monitoring, Modeling, Performance & Design Work. Columbia University, New York, NY, USA, 2015.

[2] *Extreme Rainfall Mechanisms, Prediction, and Simulation at Chonbuk National University in Summer 2015*. NSF EAPSI closing ceremony presentation series at the National Research Foundation of Korea. Seoul, South Korea, 2015.

[3] *NYC Urban Water Quality: Monitoring the Flow of CSOs with Citizen Scientists (with R. Gibson and D. Hsueh)*. Citizens Advisory Committee, New York-New Jersey Harbor & Estuary Program meeting. New York, NY, USA, 2015.

[4] *Water Quality Monitoring: 2013 Citizens' Water Quality Testing Program*. New York City Department of Environmental Protect and New York City Department of Health. New York, NY, USA, 2014.

[5] *Understanding Climate Risks in an Urban Environment (with M. Haraguchi)*. NSF IGERT, Solving Urbanization Challenges by Design summer workshop series. Columbia University, New York, NY, USA, 2013.

[6] *Urban Water Cycle Responses to Climate*. NSF IGERT, Solving Urbanization Challenges by Design Brown Bag seminar series. Columbia University, New York, NY, USA, 2013.

## Invited Panel Participation

[1] *2016 Planet Forward Sustainable Cities Summit: Rethinking Water: Solutions for a 21st Century Infrastructure*. George Washington University, Washington DC, USA, 2016.

[2] *Earth Institue Sustainable Development Seminar Series: The Monster El Niño Of 2015-16: What Was Expected? And, What Was Done?* Columbia Univeristy, New York, NY, USA, 2016.

## Professional Affiliations

**Member**, *American Geophysical Union* and *American Meteorological Society*

## Select Honors and Awards

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|---|---|
| 2015 | **National Science Foundation/National Research Foundation of Korea EAPSI Fellowship**, *National Science Foundation* |
| 2015 | **Graduate Research Fellowship Program Honorable Mention**, *National Science Foundation* |
| 2012–Present | **Integrated Graduate Education and Research Traineeship**, *National Science Foundation* |
| 2012 | **Best Poster Presentation**, *22nd Annual Great Lakes Research Consortium* |
| 2012 | **Garmen Scholarship, Robert P. Apmann Memorial Award, and Undergraduate Research Award**, *SUNY-Buffalo* |

## Recent Community Involvement

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|---|---|
| 2017–Present | **Volunteer**, *We Run As One Summer Youth Basketball and cultural exchange*, New York, NY<br>Event set-up, take-down, and score keeping |
| 2014–Present | **Volunteer**, *Student Sponsor Partners*, New York, NY<br>High school student mentor |
| 2014, 2016, 2017 | **Volunteer**, *International Research Institute for Climate and Society*, New York, NY<br>Facilitator at Lamont Doherty Earth Observatory open house |
| 2013–2014 | **Volunteer**, *Citizen's Water Quality Testing Program*, New York, NY<br>Water quality sampling site coordinator |

## Select Computer Skills

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|---|---|
| Languages | Proficient in **R**; Experience with Matlab, Python, C++ |
| Software | Proficient in Markdown, LaTeX, Microsoft Word/Powerpoint/Excel |

## Media Appearances

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|---|---|
| December 12, 2018 | **Work highlighted and quoted in Ines Kagubare's: "Study tracks climate variation's impact on green power"**, E&E News<br>https://www.eenews.net/climatewire/2018/12/12/stories/1060109407 |
| December 11, 2018 | **Work highlighted and quoted in Sarah Fecht's: "How climate impacts solar and wind power supply"**, Earth Institute's State of the Planet blog *and* Phys.org<br>https://blogs.ei.columbia.edu/2018/12/11/climate-solar-wind-power-supply/ *and* https://phys.org/news/2018-12-climate-impacts-solar-power.html |
| September 20, 2017 | **Quoted in Renee Cho's: "What the U.S. Military is Doing About Climate Change"**, Earth Institute<br>https://phys.org/news/2018-12-climate-impacts-solar-power.html |
| April 28, 2016 | **Quoted in Mike Hower's: "Sustainable Cities Summit tackles the challenges of urban sustainability"**, Planet Forward<br>https://www.planetforward.org/2016/04/28/sustainable-cities-summit-tackles-the-challenges-of-urban-sustainability |
| April 27, 2016 | **Quoted in Mike Hower's: "The 5 toughest challenges tomorrow's cities face"**, GreenBiz<br>https://www.greenbiz.com/article/5-toughest-challenges-tomorrows-cities-face |

Last updated on September 21, 2020