

Xiaodong Chen, Ph.D.

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Research Interests

- Hydroclimate Extreme Events (extreme precipitation and flooding)
- Regional Climate Modeling and Applications
- Machine Learning and Neuralhydrology
- Engineering Hydrometeorology

Research Experience

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|-----------------|---|
| 2021.2 - now | Earth Scientist Pacific Northwest National Laboratory, Richland, WA, USA |
| 2018.3 - 2021.1 | Postdoctoral Research Associate Pacific Northwest National Laboratory, Richland, WA, USA |
| 2013.7 - 2013.8 | Visiting Scholar National Institute for Environmental Studies, Tsukuba, Ibaraki, Japan |

Degrees

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|------------------|---|
| 2015.3 – 2017.12 | Ph.D. in Civil and Environmental Engineering <i>Dissertation: “Understanding probable maximum precipitation and safety of water management infrastructures under a changing climate”</i> Department of Civil and Environmental Engineering, University of Washington, USA |
| 2011.9 – 2015.3 | M.S. in Civil and Environmental Engineering <i>Thesis: “Model estimate of Pan-Arctic wetland methane emissions and their climate sensitivity during 1960-2006”</i> Department of Civil and Environmental Engineering, University of Washington, USA |
| 2007.9 – 2011.7 | Bachelor in Hydraulic Engineering Department of Hydraulic Engineering, Tsinghua University, China |

Honors and Awards

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|------|---|---------------------------------|
| 2021 | Pathway to Excellence Award | PNNL |
| 2020 | Editor’s Award (<i>Journal of Hydrometeorology</i>) | American Meteorological Society |
| 2019 | EED Of-The-Year Award | PNNL Energy and Environment |

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| 2019 | Editor's Award, <i>Advances in Atmospheric Sciences</i> | Directorate Springer Sciences+Business Media and Science Press |
| 2015 | Graduate Student Fellowship | University of Washington |
| 2010 | Friend of Tsinghua-Huang Qianheng Scholarship | Tsinghua University |
| 2010 | Second Prize in 2 nd Hydrological Innovation Competition | Tsinghua University |
| 2009 | Allen T. Chwang Award of Fluid Mechanics | Tsinghua University |

Grants

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| 2021.11 – 2022.9 | Understanding the Physics Representation of Deep Learning Models in Environmental Applications (PI, \$80,000), PNNL |
| 2019.10 – 2020.9 | Approaching High-resolution Downscaling of Climate Projections with Machine Learning (PI, \$7,000), PNNL |

Community Services

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| Editorial | Associate Editor: Journal of Hydrometeorology (2018 - present) Review Editor: Frontiers in Water (2021 - present) Frontiers in Climate (2021 – present) |
| Reviewer | IPCC AR6 WG I report (SOD expert reviewer) |
| Convener | AGU Fall Meeting 2021 (GC052 - Integrated investigations of hydroclimate variability and extremes across multiple scales: processes and implications over complex terrains) |
| Referee | Advances in Atmospheric Sciences; Atmosfera; Atmosphere; Atmospheric Sciences Letters; Climate Dynamics; Earth's Future; Earth Interactions; Estuarine, Coastal, and Shelf Science; Geophysical Research Letters; International Journal of Biometeorology; Journal of Applied Meteorology and Climatology; Journal of Geophysical Research: Atmosphere; Journal of Hydrologic Engineering; Journal of Hydrology; Journal of Hydrometeorology; Resources, Conservation & Recycling; Water Resources Research; WIREs Water |
| Mentor | Hisham Eldardiry (Ph.D. student at University of Washington, 2016-2017) Asif Mahmood (Ph.D. student at University of Washington, 2015-2016) |
| Judge | PNNL Post Graduate Research Symposium (2018, 2021) |

Publications

* Indicates corresponding author(s)

1. **Chen, X.***, L. R. Leung*, Y. Gao, and Y. Liu (2021), Response of U.S. West Coast mountain snowpack to local sea surface temperature perturbations: Insights from regional climate simulations and machine learning models. *J. Hydrometeor.*, 22, 1045-1062.
2. Dong L., L. Leung, Y. Qian, Y. Zou, F. Song, and **X. Chen**, Meteorological environments associated with California wildfires and their role in wildfire changes during 1984-2017. *J. Geophys. Res.: Atmos.*, 126, e2020JD033180.

3. Wang, L., Y. Qian*, L.R. Leung, **X. Chen***, et al. (2021), Multiple metrics informed projections of future precipitation in China. *Geophys. Res. Lett.*, 48, e2021GL093810
4. **Chen, X.*** and L. R. Leung* (2020), Response of landfalling atmospheric rivers on the U.S. west coast to local sea surface temperature perturbations. *Geophys. Res. Lett.* 47, e2020GL089254.
5. Yan, H., N. Sun, **X. Chen**, and M. Wigmosta (2020): Next-Generation Intensity-Duration-Frequency Curves for Climate-Resilient Infrastructure Design: Advances and Opportunities. *Frontiers in Water*, 2, 59.
6. Anderson, C. et al. (2020), Soil moisture and hydrology projections of the permafrost region - A model intercomparison, *The Cryosphere*, 14, 445–459.
7. **Chen, X.***, Z. Duan, L. R. Leung*, and M. Wigmosta (2019), A framework to delineate precipitation-runoff regimes: Precipitation vs. snowpack in the western U.S., *Geophys. Res. Lett.*, 46, 13044–13053. [[EOS Highlight](#)]
8. Perkins, W. A. et al. (2019), Parallel distributed hydrology model using global arrays, *Env. Mod. Soft.*, 122, 104533.
9. **Chen, X.***, L. R. Leung*, M. Wigmosta, and M. Richmond (2019), Impact of atmospheric rivers on surface hydrological processes in western U.S. watersheds, *J. Geophys. Res.: Atmos.*, 124, 8896–8916. [[EOS Highlight](#)] [[Cover Image](#)]
10. **Chen, X.** and F. Hossain (2019), Understanding future safety of dams in a changing climate, *B. Am. Meteorol. Soc.*, 100, 1395-1404.
11. Eldardiry, H. et al. (2019), Atmospheric river-induced precipitation and snowpack during the western United States cold season, *J. Hydrometeor.*, 20, 613-630.
12. **Chen, X.**, L. R. Leung, Y. Gao, Y. Liu, M. Wigmosta, and M. Richmond (2018), Predictability of extreme precipitation in western U.S. watersheds based on atmospheric river occurrence, intensity, and duration, *Geophys. Res. Lett.*, 45, 11693–11701.
13. **Chen, X.**, and F. Hossain (2018), Understanding model-based probable maximum precipitation estimation as a function of location and season from atmospheric reanalysis, *J. Hydrometeor.*, 19, 459-475.
14. **Chen, X.**, F. Hossain, and L. R. Leung (2017), Probable maximum precipitation in the U.S. Pacific Northwest in a changing climate, *Water Resour. Res.*, 53, 9600-9622.
15. **Chen, X.**, F. Hossain, and L. R. Leung (2017), Establishing a numerical modeling framework for hydrologic engineering analyses of extreme storm events, *J. Hydrol. Eng.* 22, 04017016.
16. Xia, J., et al. (2017), Terrestrial ecosystem model performance in simulating net primary productivity and its vulnerability to climate change in the northern permafrost region. *J. Geophys. Res.: Biogeosciences.*, 122, 430-446.
17. **Chen, X.** and F. Hossain (2016), Revisiting extreme storms of the past 100 years for future safety of large water management infrastructures. *Earth's Future*, 4, 306–322.
18. Sikder, S., **X. Chen**, F. Hossain, J. Roberts, F. Robertson, C. Shum, and F. Turk (2016), Are general circulation models ready for operational streamflow forecasting for water management in the Ganges and Brahmaputra river basins? *J. Hydrometeor.*, 17, 195–210.
19. McGuire, A. D., et al. (2016), Variability in the sensitivity among model simulations of permafrost and carbon dynamics in the permafrost region between 1960 and 2009, *Global Biogeochem. Cycles*, 30, 1015–1037.

20. Wang, W., et al. (2016), Evaluation of air–soil temperature relationships simulated by land surface models during winter across the permafrost region, *The Cryosphere*, 10, 1721-1737.
21. Peng, S., et al. (2016), Simulated high-latitude soil thermal dynamics during the past 4 decades, *The Cryosphere*, 10, 179-192.
22. Bonnema, M., S. Sikder, Y. Miao, **X. Chen**, F. Hossain, I. Ara Pervin, S. M. Mahbubur Rahman, and H. Lee (2016), Understanding satellite-based monthly-to-seasonal reservoir outflow estimation as a function of hydrologic controls, *Water Resour. Res.*, 52, 4095–4115.
23. **Chen, X.**, Bohn, T. J., and Lettenmaier, D. P. (2015), Model estimates of climate controls on pan-Arctic wetland methane emissions, *Biogeosciences*, 12, 6259-6277.
24. Rawlins, M. A., et al. (2015), Assessment of model estimates of land-atmosphere CO₂ exchange across Northern Eurasia, *Biogeosciences*, 12, 4385-4405.
25. Koven, C. D., et al. (2015), A simplified, data-constrained approach to estimate the permafrost carbon–climate feedback. *Phil. Trans. R. Soc. A*, 373: 20140423.
26. Bohn, T. J., et al. (2013), Modeling the large-scale effects of surface moisture heterogeneity on wetland carbon fluxes in the West Siberian Lowland, *Biogeosciences*, 10, 6559-6576.

In Progress

1. **Chen, X.***, L. R. Leung*, and L. Dong, Antecedent hydrometeorological conditions of wildfire occurrence and their trends in the western U.S. during 1984-2018. (in revision)

Book Chapters

1. **Chen, X.*** (2020), Safety design of water infrastructures in a modern era, *Resilience of Large Water Management Infrastructure: Solutions from Modern Atmospheric Science*, Springer.
2. **Chen, X.**, F. Hossain, and L. R. Leung (2020), Application of numerical atmospheric models, *Resilience of Large Water Management Infrastructure: Solutions from Modern Atmospheric Science*, Springer.
3. **Chen, X.** and F. Hossain (2020), Infrastructure-relevant storms of the last century, *Resilience of Large Water Management Infrastructure: Solutions from Modern Atmospheric Science*, Springer.

Non Peer-reviewed Articles

1. Miao, Y., **X. Chen**, and F. Hossain (2016), Maximizing Hydropower Generation with Numerical Modeling of the Atmosphere, *J. Hydrol. Eng.* (forum article), 21, 02516002.

Talks and Oral Presentations (only those given by me)

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1. **Chen, X.**, L. R. Leung, Z. Duan, Y. Gao, Y. Liu, M. Wigmosta, M. Marshall, Footprint of atmospheric rivers on land and implications for managing water resources (invited), California Extreme Precipitation Symposium (Davis, CA, 2020)
 2. **Chen, X.**, Introduction to VIC model and its application in wetland methane emissions estimation (invited), National Institute of Environmental Studies workshop (Tsukuba, Japan, 2013)
 3. **Chen, X.**, T. J. Bohn, M. Glagolev, S. Maksyutov, D. P. Lettenmaier, Model Estimates of Pan-

Arctic Lakes and Wetlands Methane Emissions (invited), ENVIROMIS-2012 Summer Workshop (Irkutsk, Russia, 2012)

4. **Chen, X.**, L. R. Leung, Z. Feng, and H. Hu, Floods Produced by Sequential Mesoscale Convective Systems under Future Climate, American Meteorological Society (AMS) 102nd Annual Meeting (online, 2022)
5. **Chen, X.**, L. R. Leung, and L. Dong, Antecedent Hydrometeorological Conditions of Wildfire Occurrence in the Western U.S., American Geophysical Union (AGU) Fall Meeting (online, 2021)
6. **Chen, X.**, L. R. Leung, Y. Gao, Y. Liu, Understanding the Response of U.S. West Coast Mountain Snowpack to Sea Surface Temperature Perturbations: A Local Perspective, AMS 101st Annual Meeting (online, 2021)
7. **Chen, X.**, Understanding the hydro-climate system of western U.S. with regional climate modeling and machine learning, PNNL ASGC Seminar (Richland, WA, 2020)
8. **Chen, X.**, L. R. Leung, C. Dang, Y. Gao, and Y. Liu, Precipitation Morphology in the Western United States: Its Relationship to Ambient Atmospheric Conditions and Future Changes, AMS 100th Annual Meeting (Boston, MA, 2020)
9. **Chen, X.**, L. R. Leung, Y. Gao, Y. Liu, Z. Duan, M. Wigmosta, M. Richmond Atmospheric rivers, extreme precipitation, and rain-on-snow: A model-based investigation of hydroclimate extremes in the western U.S., PNNL ASGC Division Seminar (Richland, WA, 2019)
10. **Chen, X.**, Z. Duan, L. R. Leung, M. Wigmosta, A framework to delineate precipitation-runoff regimes: Precipitation vs. snowpack in the western U.S., PNNL Post Graduate Research Symposium, Richland (Richland, WA, 2019)
11. **Chen, X.**, L. R. Leung, Y. Gao, Y. Liu, M. Wigmosta, M. Richmond, Predictability of Extreme Precipitation in Western U.S. Watersheds Based on Atmospheric River Occurrence, Intensity, and Duration, PNNL Post Graduate Research Symposium (Richland, WA, 2018)
12. **Chen, X.**, and F. Hossain, Climate Controls on the Extreme Rainstorms in the Contiguous US: 1979-2015, AMS 97th Annual Meeting (Seattle, WA, 2017)

Memberships

- American Geophysical Union (2012 - present)
- American Meteorological Society (2015 - present)
- American Society of Civil Engineers (2015 - present)
 - Observer of the Task Committee “Infrastructure Impacts of Landscape-driven Weather Change”

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