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

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

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

Honors and Awards

2021	Pathway to Excellence Award	PNNL
2020	Editor's Award (*Journal of Hydrometeorology*)	American Meteorological Society
2019	EED Of-The-Year Award	PNNL Energy and Environment

		Directorate
2019	Editor's Award, *Advances in Atmospheric Sciences*	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 2nd Hydrological Innovation Competition	Tsinghua University
2009	Allen T. Chwang Award of Fluid Mechanics	Tsinghua University

Grants

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

Teaching and Mentoring Experience

Ph.D. committee	Yixin Yang (Nanjing University, 2022-present)
Mentor	Hisham Eldardiry (Ph.D. student at University of Washington, 2016-2017) Asif Mahmood (Master student at University of Washington, 2015-2016)
Guest Lecturer	AAG33H, National Institude of Education (Singapore, March 2022)
Teaching assistant	CEE 599 (Remote Sensing), University of Washington (Spring 2017; Spring 2015) CEE 599 (Water Resource Management), University of Washington (Spring 2016)

Community Services

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 Climate; Journal of Geophysical Research: Atmosphere; Journal of Hydrologic Engineering; Journal of Hydrology; Journal of Hydrometeorology; Resources, Conservation & Recycling; Water Resources Research; WIREs Water
Judge	PNNL Post Graduate Research Symposium (2018, 2021, 2022)

Publications

* Indicates corresponding author(s)

1. Wang, Q., L. Yang*, Y. Yang, and **X. Chen*** (2022), Contrasting Climatic Trends of Atmospheric River Occurrences over East Asia. *Geophys. Res. Lett.*, 49, e2022GL099646.
2. Yang, Y., L. Yang*, **X. Chen**, Q. Wang, and F. Tian (2022). Climate leads to reversed latitudinal changes in Chinese flood peak timing. *Earth's Future*, 10, e2022EF002726.
3. Fan, J.*, et al. (2022). Contrasting responses of hailstorms to anthropogenic climate change in different synoptic weather systems. *Earth's Future*, 10, e2022EF002768.
4. **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.
5. 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.
6. 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.
7. **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.
8. 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.
9. Anderson, C.*, et al. (2020), Soil moisture and hydrology projections of the permafrost region - A model intercomparison, *The Cryosphere*, 14, 445–459.
10. **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]
11. Perkins, W. A.*, et al. (2019), Parallel distributed hydrology model using global arrays, *Env. Mod. Soft.*, 122, 104533.
12. **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]
13. **Chen, X.** and F. Hossain* (2019), Understanding future safety of dams in a changing climate, *B. Am. Meteorol. Soc.*, 100, 1395-1404.
14. Eldardiry, H. et al. (2019), Atmospheric river-induced precipitation and snowpack during the western United States cold season, *J. Hydrometeor.*, 20, 613-630.
15. **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.
16. **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.

17. **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.
18. **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.
19. 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.
20. **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.
21. 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.
22. 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.
23. 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.
24. Peng, S.*, et al. (2016), Simulated high-latitude soil thermal dynamics during the past 4 decades, *The Cryosphere*, 10, 179-192.
25. 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.
26. **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.
27. Rawlins, M. A.*, et al. (2015), Assessment of model estimates of land-atmosphere CO2 exchange across Northern Eurasia, *Biogeosciences*, 12, 4385-4405.
28. 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.
29. 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.

<u>In Progress</u>

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)
2. **Chen, X.*,** L. R. Leung*, Y. Gao, Y. Liu, and M. Wigmosta, Sharpening of Future Western US Cold Season Storms Modifies Area-Intensity Relationship for Safe Design. (under review)
3. Li, J.*, Qian, Y., Leung, L. R., Chen, X., Yang, Z., and Feng Z.: Potential weakening of the June 2012 North American derecho under future warming (under review)
4. Yang, Z.*, Qian, Y., Wang, J., Xue, P., Pringle, W., Li, J., Chen, X.: What are the moisture sources linking to the increased Great Lakes precipitation? (under review)

<u>Book Chapters</u>

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.

Invited Talks

1. Chen, X., *Improved understanding of the regional hydro-climate extremes from machine learning*, College of Global Change and Earth System Science, Beijing Normal University, 2022, online
2. Chen, X., *Improved understanding of the regional hydro-climate extremes from machine learning*, School of Geographic and Oceanographic Sciences, Nanjing University, 2022, online
3. Chen, X., *Understanding the regional hydro-climate extreme events with machine learning*, National Institute of Education, Nanyang Technological University, 2022, online
4. Chen, X., *Footprint of atmospheric rivers on land and implications for managing water resources*, California Extreme Precipitation Symposium, 2020, Davis, CA
5. Chen, X., *Introduction to VIC model and its application in wetland methane emissions estimation*, National Institute of Environmental Studies workshop, 2013, Tsukuba, Japan
6. Chen, X., *Model Estimates of Pan-Arctic Lakes and Wetlands Methane Emissions*, ENVIROMIS-2012 Summer Workshop, 2012, Irkutsk, Russia

Conference Presentations (only those given by me)

1. Chen, X., L. R. Leung, and N. Sun, *Quantifying the Predictability of Coastal Hydroclimate Conditions from Large-scale Climate Driver*, American Geophysical Union (AGU) Fall Meeting (online, 2022)
2. 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)
3. Chen, X., L. R. Leung, and L. Dong, *Antecedent Hydrometeorological Conditions of Wildfire Occurrence in the Western U.S.*, AGU Fall Meeting (online, 2021)
4. 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 101 st Annual Meeting (online, 2021)
5. Chen, X., *Understanding the hydro-climate system of western U.S. with regional climate*

modeling and machine learning, PNNL ASGC Seminar (Richland, WA, 2020)

6. 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)
7. 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 (Richalnd, WA, 2019)
8. 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)
9. 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)
10. 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"
- Chinese-American Oceanic and Atmospheric Association (2018 - present)
  President of the Northwest Chapter (2021 – present)

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