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Education

Ph.D., Civil Engineering, Purdue University, May 2008
- Major: Hydraulic and Hydrologic Engineering
- Dissertation: Multivariate Statistical Analysis of Indiana Hydrologic Data
- Advisor: Dr. Rao S. Govindaraju

M.S., Civil Engineering, National Taiwan University, June 2001
- Major: Hydraulic Engineering
- Thesis: A Study in Development of Regional Design Hyetographs
- Advisor: Dr. Gwo-Fong Lin

B.S., Civil Engineering, National Taiwan University, June 1999

Other:
- NAFTA Student Exchange Program, Lakehead University (Canada), June–July 2006

Appointments

Nov 2021–present	Program Manager, Water Power Program, Oak Ridge National Laboratory, Oak Ridge, TN
Oct 2020–present	Group Leader, Water Resource Science and Engineering Group, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Jan 2017–present	Senior Research Staff, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Jan 2017–Jun 2021	Joint Faculty, The Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN
Dec 2013–Sep 2020	Team Leader, Hydrologic Systems Analysis Team, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Dec 2013–Dec 2016	Research Staff, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Dec 2010–Nov 2013	Research Associate, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Feb 2009–Nov 2010	Post-doctoral Research Associate, Computational Sciences and Engineering Division, Oak Ridge National Laboratory, Oak Ridge, TN
May 2008–Jan 2009	Post-doctoral Research Associate, School of Civil Engineering, Purdue University, West Lafayette, IN
Aug 2004–May 2008	Graduate Research/Teaching Assistant, School of Civil Engineering, Purdue University, West Lafayette, IN
March 2003–July2004	Full-time Teaching Assistant, Department of Civil Engineering, National Taiwan University, Taipei, Taiwan

Honors / Certificates

July 2020	Best Paper Award, Platform for Advanced Scientific Computing 2020 (PASC20) Annual Conference – Sharif et al. (2020), Performance Evaluation of a Two Dimensional Flood Model on Heterogeneous High-Performance Computing Architectures, https://www.pasc-conference.org/pasc20-papers-open-access-via-acms-opentoc-and-best-paper-award/.
April 2014	Significant Event Award – "National Hydropower Asset Assessment Program (NHAAP)," Oak Ridge National Laboratory
Oct 2013	Statistical Hydrology Best Paper Award, International Commission on Statistical Hydrology, International Association of Hydrological Sciences
Jan 2010	Outstanding Reviewer Award, Journal of Hydrologic Engineering, American Society of Civil Engineers
Oct 2008	Civil Engineering Best Dissertation Award, Purdue University
Apr 2008	Gerrit H. Toebes Memorial Award, Purdue University
Oct 2007	Jacques W. Delleur Traveling Award, Purdue University
April 2006	Estus H. and Vashti L. Magoon Outstanding Teaching Assistant Award, Purdue University
Oct 2005	Passed the NCEES Fundamentals of Engineering Examinations
June 2001	Honorary member of the Phi Tau Phi Scholastic Society, Taiwan
May 2001	Certificate of Civil Engineer, Taiwan (PE equivalent)

Media Attention

Aug 2022	ORNL's Supercomputer-Powered TRITON Tool Models Flooding, https://www.hpcwire.com/2022/08/03/ornls-supercomputer-powered-triton-tool-models-flooding
Aug 2022	TRITON: A Powerful Toolkit for Modern Flood Modeling, https://www.olcf.ornl.gov/2022/07/25/new-model-harnesses-supercomputing-power-for-more-accurate-flood-simulations
Dec 2021	Oak Ridge's Supercomputers Help Scientists Conduct Unique Research, https://fedtechmagazine.com/article/2021/12/oak-ridges-supercomputers-help-scientists-conduct-unique-research
Sept 2021	Environment – Hotter urban hydrology, https://www.ornl.gov/news/environment-hotter-urban-hydrology
Jan 2021	New Daymet Data Facilitate Environmental Science, Earth System Modeling, https://www.ornl.gov/research-highlight/new-daymet-data-facilitate-environmental-science-earth-system-modeling
Jan 2021	Modeling – Mapping the flood, https://www.ornl.gov/news/modeling-mapping-flood
Feb 2010	Is February Flooding the New Normal in East Tennessee?, https://www.wbir.com/article/weather/is-february-flooding-the-new-normal-in-east-tennessee/51-3da6c242-75bd-4dd0-9b9a-700bf6244ee5

List of Publications

Peer-reviewed Journal Articles

[65] Gangrade, S., D. Lu, S.-C. Kao, and S. L. Painter (2022), Machine Learning Assisted Reservoir Operation Model for Long-Term Water Management Simulation, *J. Am. Water Resour. As.*, https://doi.org/10.1111/1752-1688.13060.

[64] Rastogi, D., S.-C. Kao, and M. Ashfaq (2022), How May the Choice of Downscaling Techniques

and Meteorological Reference Observations Affect Future Hydroclimate Projections?, *Earth's Future*, *10*, e2022EF002734, https://doi.org/10.1029/2022EF002734.

[63] Pilla, R., N. Griffiths, L. Gu, S.-C. Kao, R. McManamay, D. Ricciuto, X. Shi (2022), Anthropogenically Driven Climate and Landscape Change Effects on Inland Water Carbon Dynamics: What Have We Learned and Where Are We Going?, *Glob. Change Biol.*, *00*, 1–29, https://doi.org/10.1111/gcb.16324.

[62] Mukherjee, S., A. K. Mishra, M. Ashfaq, and S.-C. Kao (2022), Relative Contribution of Anthropogenic Warming and Natural Climate Variability to Changes in Compound Drought and Heatwaves, *J. Hydrol.*, *605*, 127396, https://doi.org/10.1016/j.jhydrol.2021.127396.

[61] Li, X., C. Rankin, S. Gangrade, G. Zhao, K. Lander, N. Voisin, M. Shao, M. Morales Hernández, S.-C. Kao, and H. Gao (2021), Evaluating Precipitation, Streamflow, and Inundation Forecasting Skills During Extreme Weather Events: A Case Study for An Urban Watershed, *J. Hydrol.*, *603*, 127126, https://doi.org/10.1016/j.jhydrol.2021.127126.

[60] Troia, M. J., R. A. McManamay, S.-C. Kao, and P. O'Connor (2021), A Heuristic Tool to Assess Regional Impacts of Renewable Energy Infrastructure on Conservation Areas, *Biol. Conserv.*, *263*, 109334, https://doi.org/10.1016/j.biocon.2021.109334.

[59] Yin, J., F. T.-C. Tsai, and S.-C. Kao (2021), Accounting for Uncertainty in Complex Alluvial Aquifer Modeling by Bayesian Multi-Model Approach, *J. Hydrol.*, *601*, 126682, https://doi.org/10.1016/j.jhydrol.2021.126682.

[58] Thornton, P. E., R. Shrestha, M. M. Thornton, S.-C. Kao, Y. Wei, and B. E. Wilson (2021), Gridded Daily Weather Data for North America with Comprehensive Uncertainty Quantification, *Nature Sci. Data*, *8*, 190, https://doi.org/10.1038/s41597-021-00973-0.

[57] Heidari, H., M. Arabi, T. Warziniack, and S.-C. Kao (2021), Shifts in Hydroclimatology of U.S. Megaregions in Response to Climate Change, *Environ. Res. Commun.*, *3*, 065002, https://doi.org/10.1088/2515-7620/ac0617.

[56] Turner, S. W. D., K. Nelson, N. Voisin, V. Tidwell, A. Miara, A. Dyreson, S. Cohen, D. Mantena, J. Jin, P. Warnken, and S.-C. Kao (2021), A Multi-Reservoir Model for Projecting Drought Impacts on Thermoelectric Disruption Risk Across the Texas Power Grid, *Energy*, *231*, 120892, https://doi.org/10.1016/j.energy.2021.120892.

[55] Ghanbari, M., M. Arabi, S.-C. Kao, J. Obeysekera, and W. Sweet (2021), Climate Change and Changes in Compound Coastal-Riverine Flooding Hazard Along the U.S. Coasts, *Earth's Future*, *9*, e2021EF002055, https://doi.org/10.1029/2021EF002055.

[54] Dullo, T. T., S. Gangrade, M. Morales Hernández, M. B. Sharif, A. J. Kalyanapu, S.-C. Kao, S. K. Ghafoor, and M. Ashfaq (2021), Assessing Climate Change-induced Flood Risk in the Conasauga River Watershed: An Application of Ensemble Hydrodynamic Inundation Modeling, *Nat. Hazards Earth Syst. Sci.*, *21*, 1739–1757, https://doi.org/10.5194/nhess-21-1739-2021.

[53] Lu, D., G. Konapala, S. L. Painter, S.-C. Kao, and S. Gangrade (2021), Streamflow Simulation in Data-scarce Basins Using Bayesian and Physics-informed Machine Learning Models, *J. Hydrometeorol.*, *22*(6), 1421–1438, https://doi.org/10.1175/JHM-D-20-0082.1.

[52] Morales Hernández, M., M. B. Sharif, A. J. Kalyanapu, S. K. Ghafoor, T. T. Dullo, S. Gangrade, S.-C. Kao, M. Norman, and K. J. Evans (2021), TRITON: A Multi-GPU Open Source 2D Hydrodynamic Flood Model, *Environ. Modell. Softw.*, *141*, 105034, https://doi.org/10.1016/j.envsoft.2021.105034.

[51] Dullo, T. T., S. Gangrade, M. Morales Hernández, M. B. Sharif, S.-C. Kao, A. J. Kalyanapu, S. K. Ghafoor, and K. J. Evans (2021), Simulation of Hurricane Harvey Flood Event through Coupled Hydrologic-hydraulic Models: Challenges and Next Steps, *J. Flood Risk Manag.*, *14*, e12716, https://doi.org/10.1111/jfr3.12716.

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Resour. Res., *57*, e2020WR027751, https://doi.org/10.1029/2020WR027751.

[49] Zhao, G., H. Gao, and S.-C. Kao (2021), The Implications of Future Climate Change on the Blue Water Footprint of Hydropower in the Contiguous US, *Environ. Res. Lett.*, *16*(3), 034003, https://doi.org/10.1088/1748-9326/abd78d.

[48] Konapala, G., S.-C. Kao, and N. Addor (2020), Exploring Hydrologic Model Process Connectivity at the Continental Scale through An Information Theory Approach, *Water Resour. Res.*, *56*(10), e2020WR027340, https://doi.org/10.1029/2020WR027340.

[47] Kao, S.-C., S. T. DeNeale, E. Yegorova, J. Kanney, and M. L. Carr (2020), Variability of Precipitation Areal Reduction Factors in the Conterminous United States, *J. Hydrol. X*, *9*, 100064, https://doi.org/10.1016/j.hydroa.2020.100064.

[46] Heidari, H., M. Arabi, T. Warziniack, and S.-C. Kao (2020), Assessing Shifts in Regional Hydroclimatic Conditions of U.S. River Basins in Response to Climate Change over the 21st Century, *Earth's Future*, *8*(10), e2020EF001657, https://doi.org/10.1029/2020EF001657.

[45] Konapala, G., S.-C. Kao, S. L. Painter, and D. Lu (2020), Machine Learning Assisted Hybrid Models Can Improve Streamflow Simulation in Diverse Catchments across the Conterminous US, *Environ. Res. Lett.*, *15*(10), 104022, https://doi.org/10.1088/1748-9326/aba927.

[44] Shao, M., G. Zhao, S.-C. Kao, L. Cuo, C. Rankin, and H. Gao (2020), Quantifying the Effects of Urbanization on Floods in a Changing Environment to Promote Water Security — A Case Study of Two Adjacent Basins in Texas, *J. Hydrol.*, *589*, 125154, https://doi.org/10.1016/j.jhydrol.2020.125154.

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[41] Yang, Y., M. Pan, H. E. Beck, C. K. Fisher, R. E. Beighley, S.-C. Kao, Y. Hong, and E. F. Wood (2019), In Quest of Calibration Density and Consistency in Hydrologic Modeling: Distributed Parameter Calibration against Streamflow Characteristics, *Water Resour. Res.*, *55*, 7784–7803, https://doi.org/10.1029/2018WR024178.

[40] Forbes, W. L., J. Mao, D. M. Ricciuto, S.-C. Kao, X. Shi, A. A. Tavakoly, M. Jin, W. Guo, T. Zhao, Y. Wang, P. E. Thornton, and F. M. Hoffman (2019), Streamflow in the Columbia River Basin: Quantifying Changes over the Period 1951–2008 and Determining the Drivers of those Changes, *Water Resour. Res.*, *55*, 6640–6652, https://doi.org/10.1029/2018WR024256.

[39] Gangrade, S., S.-C. Kao, T. T. Dullo, A. J. Kalyanapu, and B. L. Preston (2019), Ensemble-based Flood Vulnerability Assessment for Probable Maximum Flood in a Changing Environment, *J. Hydrol.*, *576*, 342–355, https://doi.org/10.1016/j.jhydrol.2019.06.027.

[38] Chegwidden, O. S., B. Nijssen, D. E. Rupp, J. R. Arnold, M. P. Clark, J. J. Hamman, S.-C. Kao, Y. Mao, N. Mizukami, P. Mote, M. Pan, E. Pytlak, and M. Xiao (2019), How do Modeling Decisions Affect the Spread among Hydrologic Climate Change Projections? Exploring a Large Ensemble of Simulations across a Diversity of Hydroclimates, *Earth's Future*, *7*, 623–637, https://doi.org/10.1029/2018EF001047.

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[36] Kao, S.-C., S. T. DeNeale, and D. B. Watson (2019), Hurricane Harvey Highlights: Need to Assess the Adequacy of Probable Maximum Precipitation Estimation Methods, *J. Hydrol. Eng.*, *24*(4), 05019005, https://doi.org/10.1061/(ASCE)HE.1943-5584.0001768.

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Anderson (2018), A Stream Classification System to Explore the Physical Habitat Diversity and Anthropogenic Impacts in Riverscapes of the Eastern United States, *PLoS ONE*, *13*(6), e0198439, https://doi.org/10.1371/journal.pone.0198439.

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[32] Forbes, W., J. Mao, M. Jin, S.-C. Kao, W. Fu, X. Shi, D. M. Ricciuto, P. E. Thornton, A. Ribes, Y. Wang, S. Piao, T. Zhao, C. Schwalm, F. Hoffman, J. Fisher, A. Ito, B. Poulter, Y. Fang, H. Tian, A. Jain, and D. Hayes (2018), Contribution of Environmental Forcings to US Runoff Changes for the Period 1950–2010, *Environ. Res. Lett.*, *13*(5), https://doi.org/10.1088/1748-9326/aabb41.

[31] Naz, B. S., S.-C. Kao, M. Ashfaq, H. Gao, D. Rastogi, and S. Gangrade (2018), Effects of Climate Change on Streamflow Extremes and Implications for Reservoir Inflow in the United States, *J. Hydrol.*, *556*, 359–370, https://doi.org/10.1016/j.jhydrol.2017.11.027.

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[28] Pagán, B., M. Ashfaq, D. Rastogi, D. Kendall, S.-C. Kao, B. S. Naz, R. Mei, and J. S. Pal (2016), Extreme Hydrological Changes in the Southwestern U.S. Drive Reductions in Water Supply to Southern California by Mid Century, *Environ. Res. Lett.*, *11*(9), 094026, https://doi.org/10.1088/1748-9326/11/9/094026.

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[26] Mani, A., F. T.-C. Tsai, S.-C. Kao, B. S. Naz, M. Ashfaq, and D. Rastogi (2016), Conjunctive Management of Surface and Groundwater Resources under Projected Future Climate Change Scenarios, *J. Hydrol.*, *540*, 397–411, https://doi.org/10.1016/j.jhydrol.2016.06.021.

[25] Naz, B. S., S.-C. Kao, M. Ashfaq, D. Rastogi, R. Mei, and L. C. Bowling (2016), Regional Hydrologic Response to Climate Change in the Conterminous United States Using High-resolution Hydroclimate Simulations, *Global Planet. Change*, *143*, 100–117, https://doi.org/10.1016/j.gloplacha.2016.06.003.

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Software / Data

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[66] Shao, M., G. Zhao, C. Holmes, S.-C. Kao, and Huilin Gao (2018), Quantifying the Individual and Combined Impacts of Urbanization and Changing Climate on Hydrological Processes – A Case Study of Two Adjacent Basins in Texas, American Geophysical Union 2018 Fall Meeting, Dec. 10–14, Washington, D.C.

[65] Yuan, F., G. Wang, S.-C. Kao, J. Kumar, V. G. Salmon, C. M. Iversen, A. L. Breen, P. E. Thornton, and S. Wullschleger (2018), Pathways to High Resolution Simulation of Land Surface Processes in Arctic Region: A Case Study on C & N Cycles Using PFLOTRAN Coupled E3SM Land Model

(ELM), American Geophysical Union 2018 Fall Meeting, Dec. 10–14, Washington, D.C.

[64] Yang, Y., M. Pan, H. Beck, C. K. Fisher, E. Beighley, S.-C. Kao, Y. Hong, and E. F. Wood (2018), In Quest of Calibration Density and Consistency in Hydrologic Modeling: Distributed Parameter Calibration against Streamflow Characteristics, American Geophysical Union 2018 Fall Meeting, Dec. 10–14, Washington, D.C.

[63] Mao, J., W. Forbes, M. Jin, S.-C. Kao, W. Fu, X. Shi, D. M. Ricciuto, P. E. Thornton, A Ribes, Y. Wang, S. Piao, T. Zhao, C. R. Schwalm, F. Hoffman, J. B. Fisher, A. Ito, B. Poulter, Y. Fang, H. Tian, and A. Jain (2018), Contribution of Climatic and Non-climatic Forcings to Us Runoff Changes for the Period 1950-2010, the 15th Asia Oceania Geosciences Society Annual Meeting, June 3–8, Honolulu, HI.

[62] Gangrade, S., S.-C. Kao, B. S. Naz, D. Rastogi, M. Ashfaq, N. Singh, and B. L. Preston (2018), Evaluating the Sensitivity of Probable Maximum Flood using a High-resolution Distributed Hydrologic Model, World Environmental & Water Resources Congress 2018, June 3–7, Minneapolis, MN.

[61] Zhao., G., H. Gao, and S.-C. Kao (2018), Impacts of Historical and Future Climate Change on the Blue Water Footprint of Hydropower in the United States, World Environmental & Water Resources Congress 2018, June 3–7, Minneapolis, MN.

[60] Kalyanapu, A. J., T. T. Dullo, S. Gangrade, S.-C. Kao, R. Marshall, S. R. Islam, and S. K. Ghafoor (2018), Reconstruction of Hurricane Harvey Flooding for Harris County, TX using a GPU-accelerated 2D flood model for post-flood hazard analysis, 27th Tennessee Watershed Symposium: Adapting to Hydrologic Extremes, April 11–13, Montgomery Bell State Park, Burns, TN.

[59] Mao, J., W. Forbes, W. Fu, X. Shi, D. M. Ricciuto, M. Jin, and S.-C. Kao (2018), Detection and Attribution of the Terrestrial Runoff in the Conterminous United States, the 98th American Meteorological Society Annual Meeting, January 7–11, Austin, TX.

[58] Kao, S.-C., X. Shi, J. Kumar, D. M. Ricciuto, J. Mao, and P. E. Thornton (2017), Can Earth System Model Provide Reasonable Natural Runoff Estimates to Support Water Management Studies?, American Geophysical Union 2017 Fall Meeting, Dec. 11–15, New Orleans, LA.

[57] Kalyanapu, A. J., T. T. Dullo, S. Gangrade, S.-C. Kao, R. Marshall, S. R. Islam, and S. K. Ghafoor (2017), Hurricane Harvey Riverine Flooding: Part 1 – Reconstruction of Hurricane Harvey Flooding for Harris County, TX using a GPU-accelerated 2D flood model for post-flood hazard analysis, American Geophysical Union 2017 Fall Meeting, Dec. 11–15, New Orleans, LA.

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[55] Karakullukcu, R. E., F. T.-C. Tsai, D. Bhatta, K. Paudel, and S.-C. Kao (2017), Development of A Mississippi River Alluvial Aquifer Groundwater Model, American Geophysical Union 2017 Fall Meeting, Dec. 11–15, New Orleans, LA.

[54] Dullo, T. T., S. Gangrade, R. Marshall, S. R. Islam, S. K. Ghafoor, S.-C. Kao, and A. J. Kalyanapu (2017), A Large-scale Simulation of Climate Change Effects on Flood Regime – A Case Study for the Alabama-Coosa-Tallapoosa River Basin, American Geophysical Union 2017 Fall Meeting, Dec. 11–15, New Orleans, LA.

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Environmental & Water Resources Congress 2017, May 21–25, Sacramento, CA.

[51] Kao, S.-C., B. S. Naz, S. Gangrade, M. Ashfaq, and D. Rastogi (2016), Sensitivity of Hydrologic Extremes to Spatial Resolution of Meteorological Forcings: A Case Study of the Conterminous United States, American Geophysical Union 2016 Fall Meeting, Dec. 12–16, San Francisco, CA.

[50] Gangrade, S., S.-C. Kao, D. Rastogi, M. Ashfaq, B. S. Naz, E. D. Kabela, V. Anantharaj, N. Singh, B. L. Preston, and R. Mei (2016), Evaluation of Probable Maximum Precipitation and Flood under Climate Change in the 21st Century, American Geophysical Union 2016 Fall Meeting, Dec. 12–16, San Francisco, CA.

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[45] Zhao, G., H. Gao, B. S. Naz, S.-C. Kao, and N. Voisin (2016), Evaluating Water Supply Resilience under Future Droughts and Population Growth, World Environmental & Water Resources Congress 2016, May 22–26, West Palm Beach, FL.

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[40] Hayes, B., S.-C. Kao, J. Kanney, K. Quinlan, and S. T. DeNeale (2015), Site Specific Probable Maximum Precipitation Estimates and Professional Judgement, American Geophysical Union 2015 Fall Meeting, Dec. 14–18, San Francisco, CA.

[39] Gangrade, S., D. Rastogi, S.-C. Kao, M. Ashfaq, B. S. Naz, E. D. Kabela, V. Anantharaj, N. Singh, B. L. Preston, and R. Mei (2015), An Integrated Modeling Framework for Probable Maximum Precipitation and Flood, American Geophysical Union 2015 Fall Meeting, Dec. 14–18, San Francisco, CA.

[38] Ashfaq, M., D. Rastogi, R. Mei, S.-C. Kao, B. S. Naz, and S. Gangrade (2015), Near-term Intensification of the Hydrological Cycle in the United States, American Geophysical Union 2015 Fall Meeting, Dec. 14–18, San Francisco, CA.

[37] Dullo, T., A. Kalyanapu, S. K. Ghafoor, R. Marshall, K. Tindall, V. Anantharaj, S.-C. Kao, and S.

Gangrade (2015), Computational Performance of an OpenMP-enabled, MPI-enabled and GPU-accelerated Two-dimensional Flood Model, American Geophysical Union 2015 Fall Meeting, Dec. 14–18, San Francisco, CA.

[36] Zhao, G., H. Gao, B. S. Naz, S.-C. Kao, and N. Voisin (2015), Sensitivity of Reservoir Storage and Outflow to Climate Change in a Water-limited River Basin, American Geophysical Union 2015 Fall Meeting, Dec. 14–18, San Francisco, CA.

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[34] Chalise, D. R., P. O'Connor, S. T. DeNeale, R. Uría Martínez, and S.-C. Kao (2015), LCOE Uncertainty Analysis for Hydropower Using Monte Carlo Simulations, HydroVision International 2015, July 14–17, Portland, OR.

[33] Pasha, M. F. K., L. Rowan, D. Yeasmin, S.-C. Kao, and B. T. Smith (2015), Development of a Geospatial Diversion Model for Hydropower Resource Assessment, HydroVision International 2015, July 14–17, Portland, OR.

[32] Gangrade, S., B. S. Naz, S.-C. Kao, M. Ashfaq, R. Mei, D. Rastogi, B. L. Preston, E. D. Kabela, N. Singh, and V. Anantharaj (2015), High Resolution Distributed Hydrological Modeling for Extreme Flood Events, World Environmental & Water Resources Congress 2015, May 17–21, Austin, TX.

[31] Zhao, G., H. Gao, B. S. Naz, and S.-C. Kao (2015), Integrating Reservoir Flow Regulation Rules into a Spatially Distributed Hydrological Model, World Environmental & Water Resources Congress 2015, May 17–21, Austin, TX.

[30] Dullo, T., A. Kalyanapu, S. K. Ghafoor, V. Anantharaj, R. Marshall, J. Tatarczuk, and S.-C. Kao (2015), Computational Performance of a Two-dimensional Flood Model in Single and Multiple GPU Frameworks, European Geosciences Union General Assembly 2015, April 12–17, Vienna, Austria.

[29] Kao, S.-C., B. S. Naz, S. Gangrade, M. Ashfaq, R. Mei, and D. Rastogi (2014), Projection of Climate Change Impacts on Watershed Storage and Hydropower Generation, American Geophysical Union 2014 Fall Meeting, Dec. 14–19, San Francisco, CA.

[28] Naz, B. S., S.-C. Kao, M. Ashfaq, S. Gangrade, R. Mei, and D. Rastogi (2014), Climate Change Impacts on Reservoir Inflow in the United States, American Geophysical Union 2014 Fall Meeting, Dec. 14–19, San Francisco, CA.

[27] Ashfaq, M., D. Rastogi, R. Mei, S.-C. Kao, B. S. Naz, and S. Gangrade (2014), Ultra High-resolution Ensemble Projections of the Near-term Climate Change over the U.S., American Geophysical Union 2014 Fall Meeting, Dec. 14–19, San Francisco, CA.

[26] Naz, B. S., S.-C. Kao, M. Ashfaq, R. Mei, D. Rastogi, and L. C. Bowling (2014), Historical and Future Hydrologic Change in the Conterminous United States, American Water Resources Association 2014 Annual Water Resources Conference, November 3–6, Vienna, VA.

[25] DeNeale, S. T., Q. F. Zhang, P. W. O'Connor, and S.-C. Kao (2014), Statistical Characteristics of US Hydropower Plant Capacity Factors, HydroVision International 2014, July 22–25, Nashville, TN.

[24] Pasha, M. F. K., M. Yang, D. Yeasmin, F. Amin, S.-C. Kao, and B. T. Smith (2014), Sensitivity of Spatial Resolution in Hydropower Resource Assessment, HydroVision International 2014, July 22–25, Nashville, TN.

[23] Kao, S.-C., D. Rastogi, B. S. Naz, M. Ashfaq, B. L. Preston, E. D. Kabela, Rui Mei and N. Singh (2014), Towards the Development of an Integrated Energy-Water Risk Assessment Tool for Probable Maximum Precipitation and Flood, World Environmental & Water Resources Congress 2014, June 1–5, Portland, OR.

[22] Naz, B. S., S.-C. Kao, M. Ashfaq and R. Mei (2014), Projecting the Potential Impacts of Climate

Change on Water Resources for the Conterminous United States through High Resolution Hydro-meteorological Simulation, the 94th American Meteorological Society Annual Meeting, February 2–6, Atlanta, GA.

[21] Ashfaq, M., S.-C. Kao, R. Mei, D. Touma, D. Rastogi, S. M. Absar and B. S. Naz (2014), Ultra High-resolution Near-term Hydro-meteorological Projections and Impact Assessments over the United States and South Asia, the 94th American Meteorological Society Annual Meeting, February 2–6, Atlanta, GA.

[20] Ostro, S., D. Huber, J. H. Casola, D. P. Kaiser, T. P. Karnowski, V. C. Paquit, S.-C. Kao, J. Francis and J. Gulledge (2014), Characterizing Anomalous Mid-tropospheric Ridges and Their Trends, the 94th American Meteorological Society Annual Meeting, February 2–6, Atlanta, GA.

[19] Kao, S.-C., B. S. Naz, M. Ashfaq, and R. Mei (2013), Refining the Resolution of Future Energy-Water Projection through High Performance Computing (invited), American Geophysical Union 2013 Fall Meeting, Dec. 9–13, San Francisco, CA.

[18] Kao, S.-C., A. A. Oubeidillah, and M. F. K. Pasha (2013), Performance Evaluation of Monthly Streamflow Time Series Synthesized through USGS WaterWatch Runoff and NHDPlus River Network, World Environmental & Water Resources Congress 2013, May 19–23, Cincinnati, OH.

[17] Oubeidillah, A. A., S.-C. Kao, and M. Ashfaq (2012), A Hydrologic Model Calibration Exercise for Regional Climate Change Impact Assessment of the Conterminous U.S., American Geophysical Union 2012 Fall Meeting, Dec. 3–7, San Francisco, CA.

[16] Kao, S.-C., M. Ashfaq, M. J. Sale, A. A. Oubeidillah, and N. Diffenbaugh (2012), A Quantitative Assessment Framework for Potential Climate Change Impacts on Regional Hydropower Generation, World Environmental & Water Resources Congress 2012, May 20–24, Albuquerque, NM.

[15] Kao, S.-C., and N.-B. Chang (2012), Multivariate Flood Frequency Analysis through Copulas in a Partially Gauged Watershed, World Environmental & Water Resources Congress 2012, May 20–24, Albuquerque, NM.

[14] Kao, S.-C., H. K. Kim, C. Liu, X. Cui, and B. L. Bhaduri (2012), A Dependence-preserving Approach in Synthesizing Household Characteristics, Transpiration Research Board 91st Annual Meeting, July 22–26, Washington, D.C.

[13] Sale, M. J., S.-C. Kao, R. Uría Martínez, and Y. Wei (2011), Estimating the Effects of Climate Change on Federal Hydropower and Power Marketing, HydroVision International 2011, July 19–22, Sacramento, CA.

[12] Kao, S.-C., B. Hadjerioua, and Y. Wei (2011), Streamflow Variability and its Potential Impact on Energy Production, World Environmental & Water Resources Congress 2011, May 22–26, Palm Springs, CA.

[11] Hadjerioua, B., S.-C. Kao, M. J. Sale, Y. Wei, H. A. Shanafield III, D. P. Kaiser, S. K. SanthanaVannan, R. Devarakonda, G. Palanisamy, and B. T. Smith (2011), National Hydropower Asset Assessment Project: An Integrated Water-Infrastructure Research Platform, World Environmental & Water Resources Congress 2011, May 22–26, Palm Springs, CA.

[10] Kim, H. K., S.-C. Kao, C. Liu, X. Cui, and B. L. Bhaduri (2011), Reconstruction of Spatial Distribution of Travelers for Activity-Based Traffic Demand Model Using LandScan USA Data Set, the 2011 Association of American Geographers Annual Meeting, April 12–16, Seattle, WA.

[9] Kao, S.-C., and A. R. Ganguly (2010), Quantifying and Comparing the Intensification of Extreme Rainfall Frequency from NCEP and ERA40 Reanalysis Data, the 90th American Meteorological Society Annual Meeting, January 17–21, Atlanta, GA.

[8] Kao, S.-C., and A. R. Ganguly (2009), Intensification of Droughts in a Warming Environment: Trends, Uncertainties and Possible Impacts, American Geophysical Union 2009 Fall Meeting, Dec. 14–18, San Francisco, CA.

[7] Kao, S.-C., A. R. Ganguly, and K. Steinhaeuser (2009), Motivating Complex Dependence

Structures in Data Mining: A Case Study with Anomaly Detection in Climate, IEEE ICDM Workshop on Knowledge Discovery from Climate Data: Prediction, Extremes, and Impacts, December 6, Miami, FL, https://doi.org/10.1145/3394277.3401852 (peer-reviewed).

[6] Kao, S.-C., R. S. Govindaraju, and D. Niyogi (2009), A Spatio-Temporal Drought Analysis for the Midwestern US, World Environmental & Water Resources Congress 2009, May 18–21, Kansas City, MO.

[5] Govindaraju, R. S., and S.-C. Kao (2008), Multivariate Precipitation Analyses Using Copulas, American Geophysical Union 2008 Joint Assembly, May 27–30, Fort Lauderdale, FL.

[4] Kao, S.-C., and R. S. Govindaraju (2007), Constructing Design Rainfall Hyetographs Using Trivariate Plackett Family of Copulas, American Geophysical Union 2007 Fall Meeting, Dec. 10–14, San Francisco, CA.

[3] Kao, S.-C., and R. S. Govindaraju (2007), Statistical Analysis of Extreme Rainfall Events over Indiana, USA, World Environmental & Water Resources Congress 2007, May 15–19, Tampa, FL.

[2] Kao, S.-C., and R. S. Govindaraju (2006), Evaluating the Probabilistic Structure of Storm Surface Runoff over Indiana, USA, An International Perspective on Environmental and Water Resources, ASCE, Dec. 18–20, New Delhi, India.

[1] Lin, G.-F., and S.-C. Kao (2001), Establishment of the Regional Design Hyetographs in Taiwan, Proceedings of the 11th Hydraulics Engineering Conference, C180–C187, in July 2001, Taipei, Taiwan.

Research Projects

Jun 2022–present	DOE-TVA Climate R&D Collaboration, Oak Ridge National Laboratory. Role: Principal Investigator.
Oct 2021–present	Ecosystem Resilience to Thermal Extremes: Urbanization Impacts. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Advisor (Principal Investigator: J. Mao, ORNL).
Oct 2019–present	National Conduit Hydropower Resource Assessment. Sponsor: Water Power Technologies Office, U.S. Department of Energy. Role: Principal Investigator.
Apr 2019–present	ExaSheds: Advancing Watershed System Science using Machine Learning for Data-Intensive Extreme-Scale Simulation. Sponsor: Biological and Environmental Research Program, U.S. Department of Energy. Role: Co-investigator (Principal Investigator: S. L. Painter, ORNL).
July 2018–present	Air Force / Oak Ridge National Laboratory R&D Collaboration. Sponsor: Numerical Weather Modeling Program, U.S. Air Force. Role: Co-investigator (Principal Investigator: K. J. Evans, ORNL).
Oct 2017–present	Effects of Climate Change on Federal Hydropower – The Third 9505 Assessment. Sponsor: Water Power Technologies Office, U.S. Department of Energy. Role: Principal Investigator.
Feb 2015–present	Review of Site-Specific Probable Maximum Precipitation Analyses. Sponsor: Office of New Reactors, U.S. Nuclear Regulatory Commission. Role: Co-investigator (Principal Investigators: D. B. Watson and S. T. DeNeale, ORNL).
Oct 2018–Sep 2021	Methods for Estimating Joint Probabilities of Coincident and Correlated Flooding Mechanisms for Nuclear power Plant Flood Hazards Assessments. Sponsor: Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission. Role: Principal Investigator.
Oct 2017–Mar 2020	Application of Point Precipitation Frequency Estimates to Watersheds. Sponsor: Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission. Role: Principal Investigator.

Jul 2017–Jul 2018	Developing New Hydropower Using Existing Non-powered Dams. Sponsor: Small Business Vouchers Pilot Program, U.S. Department of Energy. Role: Principal Investigator.
Apr 2018–Sep 2018	Near Real-Time High-Resolution Gridded Weather Data System as New Force for Energy and Environmental Research. Sponsor: Climate Change Science Institute, Oak Ridge National Laboratory. Role: Co-investigator (Principal Investigator: Yaxing Wei, ORNL).
Feb 2010–Sep 2018	National Hydropower Asset Assessment Program. Sponsor: Water Power Technologies Office, U.S. Department of Energy. Role: Principal Investigator.
Oct 2013–Mar 2017	Effects of Climate Change on Federal Hydropower – The Second 9505 Assessment. Sponsor: Water Power Technologies Office, U.S. Department of Energy. Role: Principal Investigator.
Mar 2016–Sep 2016	Improve the Connection Between Earth System Models and Human Water Resources Alterations. Sponsor: Climate Change Science Institute, Oak Ridge National Laboratory. Role: Principal Investigator.
Oct 2014–Sep 2016	National Extreme Events Data and Research Center (NEED) – Transforming the National Capability for Resilience to Extreme Weather and Climate Events. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Co-investigator (Principal Investigator: D. P. Kaiser, ORNL).
Oct 2014–Sep 2016	Fine-resolution Modeling of Urban-Energy Systems' Water Footprint in River Networks. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Co-investigator (Principal Investigator: R. A. McManamay, ORNL).
Sep 2015–Mar 2016	Scoping Analytical Tools and Methods for Vulnerability Analysis of Linked Electricity Generation and River Basin Systems. Sponsor: Office of Energy Policy and Systems Analysis, U.S. Department of Energy. Role: Principal Investigator.
Oct 2013–Sep 2015	Toward the Development of an Integrated Energy-Water Risk Assessment Tool for Probable Maximum Precipitation and Flood. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Principal Investigator.
Oct 2011–Sep 2013	A Hierarchical Regional Modeling Framework for Decadal-scale Hydro-climatic Predictions and Impact Assessments. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Co-investigator (Principal Investigator: M. Ashfaq, ORNL).
Oct 2010–Sep 2012	Effects of Climate Change on Federal Hydropower – The First 9505 Assessment. Sponsor: Water Power Technologies Office, U.S. Department of Energy. Role: Principal Investigator.
Feb 2010–Jan 2011	Enhancing Climate Impact Integrated Assessment for Water through Climate Informatics. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Co- investigator (Principal Investigator: W. Christopher Lenhardt, ORNL).
Feb 2009–Jan 2010	Uncertainty Assessment and Reduction for Climate Extremes and Climate Change Impacts. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. Role: Co-investigator (Principal Investigator: A. R. Ganguly, ORNL).
Jan 2006–Jan 2009	The I-70 Greenfield Rest Area Wetland Projects. Sponsor: Indiana Department of Transportation. Role: Participant (Principal Investigator: R. S. Govindaraju, Purdue University).

Aug 2004–Jul 2005 Statistical Analysis of Indiana Rainfall Data. Sponsor: Indiana Department of Transportation. Role: Participant (Principal Investigator: A. R. Rao, Purdue University).

Service

Reviewer – Scientific and Engineering Journals

- *Advances in Water Resources*
- *British Journal of Environmental and Climate Change*
- *Climate Change*
- *Climate Risk Management*
- *Environmental Research Letters*
- *Geophysical Research Letters*
- *Hydrological Processes*
- *Hydrological Sciences Journal*
- *Hydrology and Earth System Sciences Discussions*
- *International Journal of Climatology*
- *Irrigation and Drainage*
- *Journal of Computing in Civil Engineering*
- *Journal of Geophysical Research*
- *Journal of Earth System Science*
- *Journal of Hydrologic Engineering*
- *Journal of Hydrology*
- *Journal of Hydrometeorology*
- *Journal of the American Water Resources Association*
- *Meteorological Applications*
- *Natural Hazards*
- *Nature Climate Change*
- *Nature Communications*
- *Nature Scientific Reports*
- *Physics and Chemistry of the Earth*
- *Scientia Agricola*
- *Stochastic Environmental Research and Risk Assessment*
- *Theoretical and Applied Climatology*
- *Water Resources Research*
- *Water Security*

Reviewer – Proposals

- *National Science Foundation*
- *U.S. Bureau of Reclamation Science and Technology Program*
- *U.S. Dept. of Agriculture Small Business Innovation Research Program*
- *U.S. Dept. of Energy Small Business Innovation Research Program*
- *U.S. Dept. of Energy Water Power Technologies Office*
- *Louisiana Board of Regents*
- *CEATI International*

Student Advising and Mentorship Activities

- Ph.D. Advisor

    - Sudershan Gangrade, University of Tennessee, The Bredesen Center for Interdisciplinary Research and Graduate Education, 2017–2019
- Ph.D. Dissertation Committee
    - Ehsan Beigi, Louisiana State University, Department of Civil and Environmental Engineering, 2013–2015
- Post-doctoral Research Associate
    - Dr. Ganesh Ghimire, Oak Ridge National Laboratory, 2021–present
    - Dr. Goutam Konapala, Oak Ridge National Laboratory, 2018–2020
    - Dr. Bibi S. Naz, Oak Ridge National Laboratory, 2013–2016
    - Dr. Abdoul Oubeidillah, Oak Ridge National Laboratory, 2011–2012
- Student Interns
    - Ellie Chao, University of South Carolina, 2019
    - Manqing Shao, Texas A&M University, 2018
    - Tigstu Dullo, Tennessee Technological University, 2015
    - Gang Zhao, Texas A&M University, 2014–2015
    - Brenna Elrod, University of Tennessee, Knoxville, 2013
    - Clement Oigbokie II, University of Tennessee, Knoxville, 2012–2013
    - Angela Pelle, University of Tennessee, Knoxville, 2012

Technical Association and Committee Services

- PO.DAAC Cloud Early Adopters Program, 2019–2021.
- International Commission on Statistical Hydrology, International Association of Hydrological Sciences
- “Hydroclimate” Technical Committee, Environmental and Water Resources Institute, American Society of Civil Engineers
- "Use of Atmospheric Numerical Models for Estimating Probable Maximum Precipitation" Task Committee, Environmental and Water Resources Institute, American Society of Civil Engineers
- Board member, Chinese American Water Resources Association, May 2016 – present

Conference/Workshop Organizing

- Convener – “H035. Challenges and Opportunities for Hydropower Generation Under Climate Change”, American Geophysical Union 2021 Fall Meeting
- Convener – “H226. Recent Advances in Large-Scale, High-Resolution Hydrologic and Flood Modeling Leveraging High-Performance Computing”, American Geophysical Union 2020 Fall Meeting
- Convener – “H125. Statistical Characterization and Modeling of Precipitation Variability Across Scales”, American Geophysical Union 2019 Fall Meeting
- Convener – “H100. Recent Advance in Large Scale, High Resolution Hydrologic and Flood Modeling for Intensified Extreme Events in a Changing Environment” and “H116. Statistical Characterization and Probabilistic Modeling of Precipitation Variability and Extremes Across Multiple Scales”, American Geophysical Union 2018 Fall Meeting
- Session Organizer – “Modeling Energy-Water Systems in a Changing Climate” in the Hydro-Climate Symposium of World Environmental and Water Resources Congress, 2015 – 2017
- Program Committee – 2010 IEEE ICDM International Workshop on Spatial and Spatiotemporal Data Mining, December 14, Sydney, Australia.
- Program Committee – 2010 IEEE ICDM Workshop on Knowledge Discovery from Climate Data: Prediction, Extremes, and Impacts, December 14, Sydney, Australia.

- Scientific Committee – 2010 IAHS-STAHY International Workshop on Advances in Statistical Hydrology, May 23-25, Taormina, Italy.
- Program Committee – 2009 IEEE ICDM Workshop on Knowledge Discovery from Climate Data: Prediction, Extremes, and Impacts, December 6, Miami, FL.