

Curriculum Vitae

Upmanu Lall

Alan & Carol Silberstein Professor of Engineering

Chair, Earth & Environmental Engineering

Director, Columbia Water Center

Senior Research Scientist, International Research Institute for Climate & Society

Associate Director, Applied Statistics Center

Department of Earth & Environmental Eng. & Dept. of Civil Eng. & Eng. Mechanics

Mail Code 4711

Columbia University

918 Mudd, 500 W 120th St, New York, NY, 10027

Phone: 212 854 8905 Fax: 212 854 7081

Web: <http://www.columbia.edu/~ula2> <http://water.columbia.edu> Email: ula2@columbia.edu

Biography

Dr. Upmanu Lall has broad interests in hydrology, climate dynamics, applied statistics, water resource systems analysis, risk management and sustainability. He is motivated by challenging questions at the intersection of these fields, especially where they have relevance to societal outcomes or to the advancement of science towards innovative application. His current research covers 3 major initiatives that are developed through the Columbia Water Center, of which he is the Founding Director. In the 10 years since its inception, the Columbia Water Center has become an internationally recognized center for water research.

The **Global Water Sustainability Initiative** is focused on an assessment of global water scarcity and risk, and innovations across scales – from farmer's field to reservoir optimization to national policy modifications to international trade – to develop real world solutions to an impending global water crisis. This includes the development of new agro water and chemical sensor systems to improve water use efficiency and reduce non-point source pollution as well as field studies on how to get farmers to use them; comprehensive modeling and optimization of regional crop and energy facility siting to improve water sustainability and income; field experiments of water/energy pricing policy changes; participatory reservoir management using climate scenarios, elicited stakeholder values, option contracts and insurance; and models for replicable community managed rural drinking water systems. Active field research projects are in India, China, Brazil and Peru.

The Global Flood Initiative is motivated by two factors. *First*, the incidence of extreme floods around the world is driven by large scale moisture transport from the tropical oceans, and understanding the climate controls on the generation of such moisture, its transport, and convergence is essential to improving our understanding of the recurrent and concurrent global patterns of floods, as well as their prediction in the short term and under a changing climate. To predict floods one looks at the source of the extreme rainfall rather than the hydrology of floods after it rains. A hypothesis is that floods in many places in the world may be concurrently generated or suppressed by a few underlying mechanisms. Developing a physics based understanding of these processes is critical for statistically modeling the dynamic or time varying risk associated with floods in a changing climate. *Second*, for today's global supply chains, floods that disrupt material sourcing, production, transportation or distribution channels can have significant economic impacts in areas far removed from the locations experiencing direct property loss. Understanding and modeling supply chain losses and their impacts on global food and manufactured goods supplies is important. Ways to predict and manage this risks using physical infrastructure; warning, response and recovery design; inventory and supply chain management and financial instruments such as index insurance, and catastrophe bonds is being explored.

America's Water is driven by the goal of developing sustainable water management and infrastructure design paradigms for the 21st century recognizing the linkages between urban functioning, food, water, energy and climate. It seeks to pull together a comprehensive understanding of the issues facing water infrastructure in the USA. These include: the financing of and investment in the replacement of aging infrastructure; pricing and allocating water given changing values and climate; the management of the total urban water cycle through new technologies and network topologies; groundwater depletion and national food and economic futures; and novel opportunities for flood risk management and non-point source pollution mitigation. The initiative looks back over the last century to understand how man and nature interacted to generate the current state of water in the country to provide a basis for steering future regional and national development and novel technologies targeted at the key issues identified. Current research focuses on technology integration and field testing to assess the feasibility of an urban water future that is highly decentralized, relying on local water capture, treatment and reuse; and more generally on systems modeling and projection of regional water, energy, food and socio-economic futures. This is part of a focus on the Fourth Industrial Revolution, and specifically on its implications for renewable water and energy systems, decentralized networks, and the circular economy.

These programmatic initiatives are backed by research on systems level modeling of hydrology, climate, agronomy and economics. Innovative modeling tools are being developed and field tested. Dr. Lall has pioneered the application of techniques from (a) nonlinear dynamical systems, (b) nonparametric methods of function estimation and their application to spatio-temporal dynamical systems, (c) Hierarchical Bayesian models, (d) systems optimization and simulation and (e) the study of multi-scale climate variability and change as an integral component of hydrologic systems.

He has published in journals that focus on hydrology, water resources, climate, physics, statistics, development, policy and management science. He has taught a wide variety of courses at 3 Universities, and was one of the earliest faculty recruited by the Columbia Earth Institute.

Dr. Lall has been engaged in high level public and scientific discussion through the media, the World Economic Forum, and with governments, foundations, development banks, and corporations interested in sustainability. He has served on several national and international panels. He was one of the originators of the Consortium of Universities for the Advancement of Hydrologic Science, and was the President of the Natural Hazards Focus Group of the American Geophysical Union.

Academic Training

University of Texas @ Austin, TX

PhD. Civil & Environmental Engineering

1980-1981

Dissertation: Value of data in relation to uncertainty and risk

University of Texas @ Austin, TX

M.S. Civil & Environmental Engineering

1977-1980

Thesis: Mathematical models for water-energy systems

Indian Institute of Technology Kanpur, U.P., India

B. Tech. Civil Engineering

1971-1976

Employment Record

Columbia University

<i>Chair, Earth & Environmental Eng.,</i>	<i>2018-date</i>
<i>Director, Columbia Water Center</i>	<i>2008-date</i>
<i>Alan & Carol Silberstein Professor of Engineering</i>	<i>2005-date</i>
<i>Chair, Civil Eng. & Eng. Mechanics</i>	<i>2009-2010</i>
<i>Chair, Earth & Environmental Eng.,</i>	<i>2003-2006</i>
<i>Professor, Civil Eng. & Eng. Mechanics,</i>	<i>2002-date</i>
<i>Professor, Earth & Environmental Eng.,</i>	<i>2001-date</i>
<i>Senior Research Scientist, International Research Institute for Climate & Society</i>	<i>2001-date</i>
<i>Visiting Prof., Columbia Earth Institute</i>	<i>1999-2001</i>
<i>Adjunct Res. Scientist (LDEO.)</i>	<i>1997-1999</i>

Utah State University

<i>Professor, Civil & Environmental Eng.,</i>	<i>1995-2001</i>
<i>Associate Director, Utah Water Research Lab.,</i>	<i>1997-2001</i>
<i>Associate Professor, Civil & Environmental Eng.</i>	<i>1988-1995</i>

U.S.G.S., Salt Lake City, UT *Hydrologist* *1988-1989*

University of Utah

<i>Associate Professor, Civil & Environmental Eng.</i>	<i>1987-1988</i>
<i>Assistant Professor, Civil & Environmental Eng.</i>	<i>1981-1987</i>

ISMAL, Ranchi, India *Prestressed Concrete Development Engineer* *1976-1977*

Honors and Awards

<i>John R. Parks Teachers Fellowship, College of Engineering, University of Utah</i>	<i>1982-1983</i>
<i>Outstanding Researcher, Dept. of Civil & Environ. Eng., Utah State University</i>	<i>1995-1996</i>
<i>Research Excellence Award, College of Engineering, Utah State University</i>	<i>1995-1996</i>
<i>Borland Lecture on Hydrology, AGU Hydrology Days</i>	<i>2006</i>
<i>Kim Award for Faculty Involvement, Columbia University</i>	<i>2008</i>
<i>ASCE Arid Lands Hydrology Research Award</i>	<i>2010</i>
<i>Henry Darcy Medal, European Geosciences Union</i>	<i>2014</i>
<i>Fellow, American Geophysical Union</i>	<i>2017</i>
<i>Fellow, American Association for the Advancement of Science</i>	<i>2018</i>

Teaching Experience

Undergraduate: Hydrology^{1, 2}, Water Resources Eng.^{1, 2}, Computations & Computer Analysis¹, Fluid Mechanics Lab.¹, Operations Research II¹, Systems Analysis for Civil Eng¹, Water Project Analysis¹, Statistics in Water Resources¹, Water Resource Systems Analysis¹, Groundwater Engineering², Earth Resources and the Environment³, A Better Planet by Design³, Hydrosystems Engineering³

Graduate: Optimization of Large Systems¹, Applied Probability Theory¹, Statistical Decision Theory¹, Hydro-electric Power¹, Stochastic Hydrology^{1, 2}, Groundwater Hydrology^{1, 2}, Groundwater Contaminant Transport², Groundwater Quantity and Quality Modeling², Spatial Hydrologic Analysis², Physical Hydrology^{2, 3}, Low Frequency Hydro-Climatic Variability², Environmental Statistics², Hydroclimatology², Water Management and Development³, Environmental Data Analysis³, Complexity Science³

¹University of Utah, ²Utah State University, ³Columbia University

Publications: <http://scholar.google.com/citations?user=JA0o2TUAAAAJ&hl=en>

Refereed Journal Publications

1. Zhu, W., Jia, S., Lall, U., Cao, Q., & Mahmood, R. (2018). Relative contribution of climate variability and human activities on the water loss of the Chari/Logone River discharge into Lake Chad: A conceptual and statistical approach. *Journal of Hydrology*.
2. Günter, Q., András, B., Attilio, B., Martyn, C., Christophe, C., Demetris, C., ... others. (2018). Joint Editorial Invigorating Hydrological Research through Journal Publications. *Vodohospodársky Časopis*.
3. Kim, S., Devineni, N., Lall, U., & Kim, H. (2018). Sustainable Development of Water Resources: Spatio-Temporal Analysis of Water Stress in South Korea. *Sustainability*, 10(10), 3795.
4. Mishra, V., Asoka, A., Vatta, K., & Lall, U. (2018). Groundwater depletion and associated CO2 emissions in India. *Earth's Future*.
5. Quinn, N., Blöschl, G., Bárdossy, A., Castellarin, A., Clark, M., Cudennec, C., ... others. (2018). Invigorating hydrological research through journal publications. *Ecohydrology*, 11(6), e2016.
6. Rao, M. P., Cook, E. R., Cook, B. I., Palmer, J. G., Uriarte, M., Devineni, N., ... others. (2018). Six centuries of Upper Indus Basin streamflow variability and its climatic drivers. *Water Resources Research*, 54(8), 5687–5701.
7. Ravindranath, A., Devineni, N., Lall, U., & Concha Larrauri, P. (2018). Season-ahead forecasting of water storage and irrigation requirements--an application to the southwest monsoon in India. *Hydrology and Earth System Sciences*, 22(10), 5125–5141.
8. Salem, J., Amonkar, Y., Maennling, N., Lall, U., Bonnafous, L., & Thakkar, K. (2018). An analysis of Peru: Is water driving mining conflicts? *Resources Policy*.
9. Steinschneider, S., Ho, M., Williams, A. P., Cook, E. R., & Lall, U. (2018). A 500-year tree-ring based reconstruction of extreme cold-season precipitation and number of atmospheric river landfalls across the Southwestern US. *Geophysical Research Letters*. Doi:10.1029/2018gl078089
10. Ho, M., Lall, U., & Cook, E. R. (2018). How wet and dry spells evolve across the conterminous United States based on 555 years of paleoclimate data. *Journal of Climate*, (2018).
11. Yu, Z., Miller, S., Montalto, F., & Lall, U. (2018). The bridge between precipitation and temperature–Pressure Change Events: Modeling future non-stationary precipitation. *Journal of Hydrology*, 562, 346–357.
12. Farnham, D. J., Doss-Gollin, J., & Lall, U. Regional Extreme Precipitation Events: Robust Inference From Credibly Simulated GCM Variables. *Water Resources Research*. doi: 10.1002/2017wr021318
13. Ossa-Moreno, J., McIntyre, N., Ali, S., Smart, J. C., Rivera, D., Lall, U., & Keir, G. (2018). The Hydro-economics of Mining. *Ecological Economics*, 145, 368–379.
14. Orton, P. M., Conticello, F. R., Cioffi, F., Hall, T. M., Georgas, N., Lall, U., ... MacManus, K. (2018). Flood hazard assessment from storm tides, rain and sea level rise for a tidal river estuary. *Natural Hazards*. <http://doi.org/10.1007/s11069-018-3251-x>
15. Allaire, M., Wu, H., & Lall, U. (2018). National trends in drinking water quality violations. *Proceedings of the National Academy of Sciences of the United States of America*, 115(9). <http://doi.org/10.1073/pnas.1719805115>
16. Larrauri, P. C., & Lall, U. (2018). Tailings Dams Failures: Updated Statistical Model for Discharge Volume and Runout. *Environments*, 5(2), 28.
17. Dolan, C., Blanchet, J., Iyengar, G., & Lall, U. (2018). A model robust real options valuation methodology incorporating climate risk. *Resources Policy*. <http://doi.org/10.1016/j.resourpol.2018.01.011>
18. Ennenbach, M. W., Concha Larrauri, P., & Lall, U. (2018). County-Scale Rainwater Harvesting Feasibility in the United States: Climate, Collection Area, Density, and Reuse Considerations. *Journal of the American Water Resources Association*, 54(1). <http://doi.org/10.1111/1752-1688.12607>
19. Vatta, K., Sidhu, R. S., Lall, U., Birthal, P. S., Taneja, G., Kaur, B., ... MacAlister, C. (2018). Assessing the economic impact of a low-cost water-saving irrigation technology in Indian Punjab: the tensiometer. *Water International*. <http://doi.org/10.1080/02508060.2017.1416443>

20. Lima, C. H., AghaKouchak, A., & Lall, U. (2017). Classification of mechanisms, climatic context, areal scaling, and synchronization of floods: the hydroclimatology of floods in the Upper Paraná River basin, Brazil. *Earth System Dynamics*, 8(4), 1071.
21. Farnham, D. J., Steinschneider, S., & Lall, U. (2017). Zonal Wind Indices to Reconstruct CONUS Winter Precipitation. *Geophysical Research Letters*, 44(24). <http://doi.org/10.1002/2017GL075959>
22. Conticello, F., Cioffi, F., Merz, B. and Lall, U. (2017), An event synchronization method to link heavy rainfall events and large-scale atmospheric circulation features. *Int. J. Climatol.* doi:10.1002/joc.5255
23. Zeng, Hang; Sun, Xun; Lall, Upmanu; Feng, Ping (2017), Nonstationary extreme flood/rainfall frequency analysis informed by large-scale oceanic fields for Xidayang Reservoir in North China. *International Journal of Climatology*, 37(10),3810-3820
24. Lall, Upmanu; Davis, Jenna; Scott, Christopher; Merz, Bruno; Lundqvist, Jan; (2017), Pursuing water security, *Water Security*, 1, 1-2.
25. Golding, Peter; Kapadia, Sam; Naylor, Stella; Schulz, Jonathan; Maier, Holger R; Lall, Upmanu; van der Velde, Marijn; (2017), Framework for minimising the impact of regional shocks on global food security using multi-objective ant colony optimization, *Environmental Modelling & Software*, 95, 303-319.
26. Wang, Siyan; Sun, Xun; Lall, Upmanu; (2017) A hierarchical Bayesian regression model for predicting summer residential electricity demand across the USA, *Energy*, 140, 601-611.
27. Lu, M., & Lall, U. (2017). Tropical Moisture Exports, Extreme Precipitation and Floods in Northeastern US. *Earth Science Research*, 6(2), 91.
28. Steinschneider, S., Cook, E. R., Briffa, K. R., & Lall, U. (2017). Hierarchical regression models for dendroclimatic standardization and climate reconstruction. *Dendrochronologiam* 44, 174-186.
29. Cioffi, F., Conticello, F., Lall, U., Marotta, L., & Telesca, V. (2017). Large scale climate and rainfall seasonality in a Mediterranean Area: Insights from a non-homogeneous Markov model applied to the Agro-Pontino plain. *Hydrological Processes*, 31(3), 668-686.
30. Ho, M., Lall, U., Sun, X. and Cook, E. R. (2017), Multiscale temporal variability and regional patterns in 555 years of conterminous U.S. streamflow. *Water Resour. Res.* doi:10.1002/2016WR019632
31. Lu, M., U. Lall, A. W. Robertson, and E. Cook (2017), Optimizing multiple reliable forward contracts for reservoir allocation using multitime scale streamflow forecasts, *Water Resour. Res.*, 53, doi:10.1002/2016WR019552.
32. Ceylan, G , Lall, U . (2017). Amerika Birleşik Devletleri'ndeki Minimum Akım Trendleri. *Türkiye Su Bilimleri ve Yönetimi Dergisi*, 1 (1), 71-89.
33. Bonnafous, L., Lall, U., & Siegel, J. (2017). A water risk index for portfolio exposure to climatic extremes: conceptualization and an application to the mining industry. *Hydrology and Earth System Sciences*, 21(4), 2075.
34. Bonnafous, L., U. Lall, and J. Siegel (2017), An index for drought induced financial risk in the mining industry, *Water Resour. Res.*, 53, doi:10.1002/2016WR019866.
35. Ho, M., Lall, U., Allaire, M., Devineni, N., Han Kwon, H., Pal, I., Raff, D. and Wegner, D., (2017), The future role of dams in the United States of America. *Water Resources Research*, doi:10.1002/2016WR019905.
36. Russo, T. A., & Lall, U. , Depletion and response of deep groundwater to climate-induced pumping variability. *Nature Geoscience*. doi:10.1038/ngeo2883, 2017.
37. Lall, U.; Devineni, N.; Kaheil, Y., An empirical, nonparametric simulator for multivariate random variables with differing marginal densities and nonlinear dependence with hydroclimatic applications, *Risk Analysis*,36,1,57-73, 2016
38. Lu, M., and Lall, U. (2016). Tropical Moisture Exports, Extreme Precipitation and Floods in Northeast US. *Hydrol. Earth Syst. Sci*, 1-40.

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39. Zeng, H., Sun, X., Lall, U. and Feng, P., Nonstationary extreme flood/rainfall frequency analysis informed by large-scale oceanic fields for Xidayang Reservoir in North China. *Int. J. Climatology* . doi:10.1002/joc.4955, 2016
 40. Fishman, R., U. Lall, V. Modi, and N. Parekh, "Can Electricity Pricing Save India's Groundwater? Field Evidence from a Novel Policy Mechanism in Gujarat," *Journal of the Association of Environmental and Resource Economists* 3, no. 4 (December 2016): 819-855., DOI: 10.1086/688496
 41. Steinschneider, S.; Lall, U.; Spatiotemporal Structure of Precipitation Related to Tropical Moisture Exports over the Eastern United States and Its Relation to Climate Teleconnections, *Journal of Hydrometeorology*, 17, 3, 897-913, 2016
 42. Etienne, E.; Devineni, N.; Khanbilvardi, R.; Lall, U.; Development of a Demand Sensitive Drought Index and its application for agriculture over the conterminous United States, *Journal of Hydrology*, 534, 219-229, 2016.
 43. Parhi, P.; Giannini, A.; Gentile, P.; Lall, U.; Resolving contrasting regional rainfall responses to El Nino over Tropical Africa, *Journal of Climate*, 29, 4, 1461-1476, 2016.
 44. Steinschneider, S.; Lall, U.; El Niño and the U.S. precipitation and floods: What was expected for the January–March 2016 winter hydroclimate that is now unfolding?, *Water Resources Research*, 10.1002/2015WR018470, 2016.
 45. Sahoo, S.; Russo, T.; Lall, U.; Comment on “Quantifying renewable groundwater stress with GRACE” by Alexandra S. Richey et al., *Water Resources Research*, 2016
 46. Ward, P.J.; Kumm, M.; Lall, U.; Flood frequencies and durations and their response to El Niño Southern Oscillation: Global analysis, *Journal of Hydrology*, 539, 358-378, 2016
 47. Haraguchi, M.; Lall, U.; Watanabe, Kenji; Building Private Sector Resilience: Directions After the 2015 Sendai Framework, *Journal of Disaster Research* Vol 11(3), 535, 2016
 48. Alfredo, Katherine; Montalto, Franco A; Bartrand, Timothy; Wolde-Georgis, Tsegay; Lall, Upmanu; Using a Participatory Stakeholder Process to Plan Water Development in Koraro, Ethiopia, *Water*, 8, 7, 275, 2016
 49. Ho, M.; Parthasarathy, V.; Etienne, E.; Russo, T.A.; Devineni, N.; Lall, U.; America's water: Agricultural water demands and the response of groundwater, *Geophysical Research Letters*, 43, 14, 7546-7555, 2016
 50. Kwon, Hyun-Han; Lall, Upmanu; A copula-based nonstationary frequency analysis for the 2012–2015 drought in California, *Water Resources Research*, 52, 7, 5662-5675, 2016
 51. Lima, Carlos H.R.; Lall, Upmanu; Troy, Tara; Devineni, Naresh; A hierarchical Bayesian GEV model for improving local and regional flood quantile estimates, *Journal of Hydrology*, 2016
 52. Yuan, Xiao-Chen; Sun, Xun; Lall, Upmanu; Mi, Zhi-Fu; He, Jun; Wei, Yi-Ming; China's socioeconomic risk from extreme events in a changing climate: a hierarchical Bayesian model, *Climatic Change*, , 13-Jan, 2016
 53. Kwon, Hyun-Han; Lall, Upmanu; Kim, Seong-Joon; The unusual 2013–2015 drought in South Korea in the context of a multicentury precipitation record: Inferences from a nonstationary, multivariate, Bayesian copula model, *Geophysical Research Letters*, 43, 16, 8534-8544, 2016.
 54. Cioffi, F., Conticello, F., & Lall, U. (2016). Projecting changes in Tanzania rainfall for the 21st century. *International Journal of Climatology*, (10.1002/joc.4632).
 55. Cioffi, F., Lall, U., Rus, E., & Krishnamurthy, C. K. B. (2015). Space-time structure of extreme precipitation in Europe over the last century. *International Journal of Climatology*, 35(8), 1749-1760.
 56. Devineni, N., Lall, U., Etienne, E., Shi, D., & Xi, C. (2015). America's water risk: Current demand and climate variability. *Geophysical Research Letters*, 42(7), 2285–2293.
 57. Devineni, N., Lall, U., Xi, C., & Ward, P. (2015). Scaling of extreme rainfall areas at a planetary scale. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 25(7), 75407.

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58. Dong, L., Xiong, L., Lall, U., & Wang, J. (2015). The effects of land use change and precipitation change on direct runoff in Wei River watershed, China. *Water Science and Technology*, 71(2), 289–295.
 59. Nakamura, J., Lall, U., Kushnir, Y., & Rajagopalan, B. (2015). HITS: Hurricane intensity and track simulator with North Atlantic Ocean applications for risk assessment. *Journal of Applied Meteorology and Climatology*, 54(7), 1620–1636.
 60. Haraguchi, M., & Lall, U. (2015). Flood risks and impacts: A case study of Thailand's floods in 2011 and research questions for supply chain decision making. *International Journal of Disaster Risk Reduction*, 14, 256–272.
 61. Kavvas, M. L., Govindaraju, R. S., & Lall, U. (2015). Introduction to the Focus Issue: Physics of Scaling and Self-similarity in Hydrologic Dynamics, Hydrodynamics, and Climate. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 25(7), 75201.
 62. Lima, C. H. R., Lall, U., Jebara, T., & Barnston, A. G. (2015). Machine Learning Methods for ENSO Analysis and Prediction. In *Machine Learning and Data Mining Approaches to Climate Science* (pp. 13–21). Springer International Publishing.
 63. Lima, C. H. R., Lall, U., Troy, T. J., & Devineni, N. (2015). A climate informed model for nonstationary flood risk prediction: Application to Negro River at Manaus, Amazonia. *Journal of Hydrology*, 522, 594–602.
 64. Lu, M., Tippet, M., & Lall, U. (2015). Changes in the seasonality of tornado and favorable genesis conditions in the central United States. *Geophysical Research Letters*, 42(10), 4224–4231.
 65. Lu, M., Lall, U., Kawale, J., Liess, S., & Kumar, V. (2016). Exploring the Predictability of 30-Day Extreme Precipitation Occurrence Using a Global SST–SLP Correlation Network. *Journal of Climate*, 29(3), 1013–1029.
 66. Merz, B., Vorogushyn, S., Lall, U., Viglione, A., & Blöschl, G. (2015). Charting unknown waters—On the role of surprise in flood risk assessment and management. *Water Resources Research*, 51(8), 6399–6416.
 67. Pal, I., Robertson, A. W., Lall, U., & Cane, M. A. (2015). Modeling winter rainfall in Northwest India using a hidden Markov model: understanding occurrence of different states and their dynamical connections. *Climate Dynamics*, 44(3–4), 1003–1015.
 68. Parhi, P., Giannini, A., Gentile, P., & Lall, U. (2015). Resolving contrasting regional rainfall responses to El Niño over tropical Africa. *Journal of Climate*, (2015).
 69. Robertson, A. W., Kushnir, Y., Lall, U., & Nakamura, J. (2015). Weather and Climatic Drivers of Extreme Flooding Events over the Midwest of the United States. *Extreme Events: Observations, Modeling, and Economics*, 113–124.
 70. Steinschneider, S., & Lall, U. (2015). Daily Precipitation and Tropical Moisture Exports across the Eastern United States: An Application of Archetypal Analysis to Identify Spatiotemporal Structure. *Journal of Climate*, 28(21), 8585.
 71. Sun, X., & Lall, U. (2015). Spatially coherent trends of annual maximum daily precipitation in the United States. *Geophysical Research Letters*, 42(22), 9781–9789.
 72. Vogel, R. M., Lall, U., Cai, X., Rajagopalan, B., Weiskel, P. K., Hooper, R. P., & Matalas, N. C. (2015). Hydrology: The interdisciplinary science of water. *Water Resources Research*, 51(6), 4409–4430.
 73. Zhang, Y., Yang, N., & Lall, U. (2016). Modeling and simulation of the vulnerability of interdependent power-water infrastructure networks to cascading failures. *Journal of Systems Science and Systems Engineering*, (10.1007/s11518-016-5295-3), 1–17.
 74. Farnham, David J; Lall, Upmanu; Predictive Statistical Models Linking Antecedent Meteorological Conditions and Waterway Bacterial Contamination in Urban Waterways, *Water Research*, 2015,
 75. Renard, Benjamin; Lall, Upmanu; Regional frequency analysis conditioned on large-scale atmospheric or oceanic fields. *Water Resources Research*, 50(12), 9536–9554, 2014.

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76. Lima, Carlos HR; Lall, Upmanu; Troy, Tara J; Devineni, Naresh; A climate informed model for nonstationary flood risk prediction: application to Negro River at Manaus, Amazonia, *Journal of Hydrology*, 2015
 77. Steinschneider, Scott, and Upmanu Lall. "A hierarchical Bayesian regional model for nonstationary precipitation extremes in Northern California conditioned on tropical moisture exports." *Water Resources Research* 51.3 (2015): 1472-1492.
 78. Karamperidou, Christina; Cane, Mark A; Lall, Upmanu; Wittenberg, Andrew T; Intrinsic modulation of ENSO predictability viewed through a local Lyapunov lens, *Climate Dynamics*, 42, 2-Jan, 253-270, 2014.
 79. Chen, X; Hao, Z; Devineni, N; Lall, U; Climate information based streamflow and rainfall forecasts for Huai River basin using hierarchical Bayesian modeling, *Hydrology and Earth System Sciences*, 18(4), 1539-1548, 2014.
 80. Merz, B; J Aerts, Karsten Arnbjerg-Nielsen, M Baldi, A Becker, Adeline Bichet, G Blöschl, LM Bouwer, Achim Brauer, F Cioffi, JM Delgado, M Gocht, F Guzzetti, S Harrigan, K Hirschboeck, C Kilsby, W Kron, H-H Kwon, U Lall, R Merz, K Nissen, P Salvatti, T Swierczynski, U Ulbrich, A Viglione, PJ Ward, M Weiler, B Wilhelm, M Nied; (2014) Floods and climate: emerging perspectives for flood risk assessment and management, *Natural Hazards and Earth System Sciences*, 14(7), 1921-1942
 81. Robertson, Andrew W; Baethgen, Walter; Block, Paul; Lall, Upmanu; Sankarasubramanian, Arumugam; de Souza Filho, F de Assis; Verbist, Koen MJ; (2014) Climate risk management for water in semi-arid regions, *Earth Perspectives* 11(12)
 82. Lall, Upmanu; (2014) Debates—The future of hydrological sciences: A (common) path forward? One water. One world. Many climes. Many souls, *Water Resources Research*, 50(6), 5335-5341.
 83. Cioffi, Francesco; Lall, Upmanu; Rus, Ester; Krishnamurthy, Chandra Kiran B; (2014) Space-time structure of extreme precipitation in Europe over the last century, *International Journal of Climatology*
 84. Pal, Indrani; Robertson, Andrew W; Lall, Upmanu; Cane, Mark A; (2014) Modeling winter rainfall in Northwest India using a hidden Markov model: understanding occurrence of different states and their dynamical connections, *Climate Dynamics*, 13-Jan 2014
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 212. Lall, U., 1995: A Yield Model for Screening Surface and Ground Water Development, *ASCE J. of Water Resources Planning and Management*, 121(1), 9-22.
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 214. Moon, Y. and U. Lall, 1994: A Kernel Quantile Function Estimator For Flood Frequency Analysis. *Water Resources Research*, 30(11), 3095-3103, 1994.
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 218. Lall, U. and Y-C. Lin, 1991: A groundwater management model for Salt Lake County, Utah with some water rights and water quality considerations, *Journal of Hydrology*, 123, 367-393.
 219. Lall, U. and Santini, M. D., 1989: An optimization model for stratified aquifer systems, *Journal of Hydrology*, 111, 145-162.
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 225. Lall, U. and L.W. Mays, 1981: Mathematical Models for Planning Water and Energy Systems, *Water Resources Research*, 17(4), 853-865.

REFEREED BOOK SECTIONS AND CONFERENCE PROCEEDINGS

1. Lall, U. and B. Rajagopalan, (2016), Nonparametric Methods, in *Handbook of Applied Hydrology*, Ed. V. P. Singh
2. Rajagopalan, B. and Lall, U., (2016), Stochastic Streamflow Simulation and Forecasting, in *Handbook of Applied Hydrology*, Ed. V. P. Singh
3. Russo, T. A., Devineni, N., & Lall, U. (2015). Assessment of Agricultural Water Management in Punjab, India, Using Bayesian Methods. In *Sustainability of Integrated Water Resources Management* (pp. 147–162). Springer International Publishing.
4. Lall, U., Global Freshwater and Food Security, Chapter 5, in Christopher B. Barrett, editor, *Food Security and Sociopolitical Stability* (Oxford: Oxford University Press, 2013)
5. Haraguchi, Masahiko and Upmanu Lall (2013), Flood Risks and Impacts -Future Research Questions and Implication to Private Investment Decision-Making for Supply Chain Networks. *The 2013 Global Assessment Report on Disaster Risk Reduction*. United Nations Office for Disaster Risk Reduction. May 2013.
6. Lall, U., A. Sankarasubramanian and B. Rajagopalan (2013) Floods and Changing Climate: Seasonal Forecasts and Reconstruction, in *Encyclopedia of Environmetrics*, A.-H. El-Shaarawi and W. Piegorsch (eds), John Wiley & Sons Ltd: Chichester, UK. DOI: 10.1002/9780470057339.vnn045.
7. Rajagopalan, B., Salas, J.D., Lall, U., Stochastic methods for modeling precipitation and streamflow, *Advances in Data-Based Approaches for Hydrologic Modeling and Forecasting*, B. K.S. Kumar and R. Bendtsson, Eds, 2010
8. Lall, U., Phillips, D.L., Reckhow, K.H., Loucks, D.P., 2002. Quantifying and communicating model uncertainty for decision making in the everglades. Report of the Comprehensive Everglades Restoration Plan's Model Uncertainty Workshop, US Army Corps of Engineers and South Florida Water Management District, West Palm Beach, FL, April.
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 12. Moon, Y. and U. Lall, 1994: A Kernel Quantile Function Estimator For Flood Frequency Analysis, *Extreme Values: Floods and Droughts*, ed. K. Hipel, Kluwer.
 13. Ali, A. I. and U. Lall, 1994: Stratigraphic Interpretation from Drill Log Data", *Stochastic Differential Equations with Applications in Hydrology*, ed. K. Hipel, Kluwer.
 14. Tarboton, D. G., A. Sharma and Lall, U., 1993: The use of non-parametric probability distributions in streamflow modeling. Proc. of the Sixth South African National Hydrological Symp., S. A. Lorentz, S. W. Kienzle, & M. C. Dent (Ed.), (pp. 315-327). University of Natal, Pietermaritzburg, South Africa. Oct. 1993.
 15. Duffy, C. J., Y. Fan and U. Lall, 1990: Spectral Analysis of Annual Time Series of Mountain Precipitation, *Hydraulics/Hydrology of Arid Lands*, edited by R. H. French, ASCE, 573-577.
 16. Lall, U., 1989: Optimal Reservoir Sizing with Yield Reliability, *Water Resources Planning*, edited by S. Harris, 618-621.
 17. Ghosh, S. and U. Lall, 1988: Kinetics of Anaerobic Digestion of Solid Substrates, Proc. of Intl. Assoc. on Water Pollution Research and Control Conference, AD-88, Bologna, Italy, May 22-28, 1988.
 18. Lall, U., 1987: Estimation of a Prior Distribution for Skews for the Pearson III Distribution, *Hydrologic Frequency Modeling*, Ed. V. P. Singh, 131-147.
 19. Lall, U., 1987: Project Risk considering Sampling Uncertainties and a Finite Project Operation Period, *Application of Frequency and Risk in Water Resources*, Ed. V. P. Singh, 305-318.
 20. Lall, U. and L.E. Sorenson, 1984: Inference of Mining Impacts on Groundwater through Numerical Models, Proc. of the NWWA Conference on Impacts of Mining on Ground Water, Denver, CO, August 1984.
 21. Lall, U., 1984: A Model for Optimal Dewatering of Open Pit Mines, Regional and State Water Res. Plng. & Mgmt., Proc. of the 19th. Annual AWRA Symposium, San Antonio, TX.

Presentations and Invited Presentations (too many to list)

Grants Awarded: ~\$35 million as PI or co-PI

1. *Climate Extremes: Aging Dams and Failure Impacts (Lall, U PI), Global Risk Institute \$140,000 04/01/2018-03/31/2020*
2. *Creating a Generalized Approach to Risked-Based Water Valuation for Mining (U. Lall, PI) BHP Billiton, \$156,466 12/01/2017 - 11/30/2018*
3. *Building Capacity for Rapid Financial Response to Natural Hazards (Lall, U., PI) World Bank, \$149,493. 10/16 to 5/17.*
4. *A Water Resources Decision Support System To Reduce Drought Vulnerability And Enable Adaptation To Climate Variability And Change In Pernambuco (Lall, U., PI) Inter-American Development Bank, IDB C0106-15, \$630,318, 7/15/2015-6/17/2017.*
5. *Feasibility of Decentralized Water Systems in Mexico City, Rotoplas, \$96,284, (U. Lall, PI), 2/5/2016-11/14/2016*
6. *Collaborative Research: P2C2--Multi-Site Paleo-Reconstruction of Missouri River Streamflows from Tree Ring Data AGS-1404188, NSF, \$268,050, (PI: Cook, E., CO-PIs: Lall, U., Pederson, N.), 7/14 to 6/2017*
7. *Climate-Informed Estimation Of Hydrologic Extremes For Robust Adaptation To Non- Stationary Climate Conditions, DOD-SERDP/Univ of Massachusetts, Amherst, \$388,575, (Lall, U., PI), 9/21/2015-9/20/2018.*

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8. *America's Water– The Changing Landscape of Risk, Competing Demands and Climate*, **NSF, \$2.49 million**, U. Lall (PI), L. Goddard, N. Devineni, M. Gerrard, E. Cook, T. Troy, B. O'Flaherty, M. Levy (co-PIs), 9/1/14 to 7/31/17.
 9. *Mining & Water Risk: Diagnosis, Benchmarking, and Quantitative Analysis Of Financial Impacts*, **NBIM, \$2.36 million**, U. Lall (PI), G. Iyengar, J. Blanchet, S. Thomashaussen (co-PIs), 11/1/14 – 12/31/17.
 10. *Development Of Adaptable Web Modules To Stimulate Active Learning In Hydrology Using Data And Model Simulations*, **NSF, \$98,324**, U. Lall (PI), 10/1/11-9/30/15.
 11. *Water Risk And Sustainability: Managing Water Risks Through The Supply Chain*, **PEPSICO, \$546,014**, U. Lall (PI) 2/11-1/16.
 12. *Improving Food And Livelihood Security Through Water-Energy-Agriculture Management Under Climate Change And Variability: A Field Demonstration In India*, **IDRC, \$150,967**, U. Lall (PI), 4/12-3/15.
 13. *Water-Agriculture-Livelihood Security in India*, (PI: Vatta, K., U. Lall), **USAID, \$1.73 million**, 6/1/2012-5/31/2017.
 14. *Columbia Water Center's 'Aquanauts' Education Program*, **Veolia Foundation, \$26350**, U. Lall (PI), 6/12-5/13.
 15. *Climate Informed Global Flood Risk Assessment And Updates*, **AIG, \$331,439**, U. Lall (PI), N. Devineni and T. Troy (co-PIs), 9/1/12, 8/31/13.
 16. *A Water Management Knowledge Network For The Urban Northeast*, **NOAA, \$79,658**, U. Lall (PI), N. Devineni (co-PI), 1/1/13-12/31/14.
 17. *Water Resource And Flood & Erosion Risk Mitigation Planning In Assam*, **Assam State Disaster Management Authority, \$333,903**, U. Lall (PI), T. Troy (co-PI), 1/13-1/15.
 18. *Multi-Purpose R&D Pilot Projects For Assessing The Feasibility Of Cost Effective And Sustainable Technologies For Drinking Water Storage And Distribution In Rural Areas Of Jharkhand*, **Government Of Jharkhand, India: Drinking Water & Sanitation Dept, \$347,076**, U. Lall (PI), Modi, V., Perveen, S. (co-PIs), 11/12-10/13.
 19. *Building Capacity To Manage Water Resources And Climate Risk In The Caribbean*, **LAC: ECPA/CRCA, \$741, 463**, Baethgen, W., (PI); Goddard, L., Lall, U., Perveen, S., Kelsey, R., co-PIs, 7/1/2012-6/30/2015.
 20. *Decadal Prediction And Stochastic Simulation Of Hydroclimate Over Monsoonal Asia*, **DOE, \$355,204**, Robertson, A., (PI), D'arrigo, R., Cook, E., Lall, U., Greene, A Co-Pi's), 9/1/11-8/31/2013
 21. *Northeast Urban RISA*, **NOAA, \$3,499,924**, C. Rosenzweig (PI), U. Lall, P. Kinney, S. Someshwar, L. Goddard, R. Chen, and Y. Kushnir (co-PIs), 10/1/2010 – 9/31/2016.
 22. *Climate Predictability of Extreme Floods*, **NOAA, \$439,230**, U. Lall (PI), Y. Kushnir, A Robertson, J. Nakamura (co-PIs), 6/1/2010 – 5/31/2013.
 23. *Reconstructing Climate From Tree Ring Data* **NSF, \$598,084**, A. Gelman (PI), E. Cook and U. Lall (co-PIs), 10/1/2009 – 9/30/2012.
 24. *Paleoclimate Shocks: Environmental Variability, Human Vulnerability, and Social Adaptation During The Last Millennium In The Greater Mekong Basin*, **NSF, \$1,401,351**, 8/1/2009-7/31/2013. Buckley, B., (PI); Anchukaitis, K., Cook, B., Heikkila, T., Lall, U., Cook, E., Levy, M.; (Co PIs)
 25. *How Can the Contribution of Climate Variability, Water Release Patterns, and Hydrologic Performance Indices towards Ecological Restoration Measures at the Everglades National Park be Best Quantified and Predicted?* **National Park Service, \$151,721**, U. Lall (PI), 4/08 to 5/13.
 26. *Improving rural water and livelihood outcomes in India, China, Africa, and Brazil*, **PepsiCo Foundation, \$6,000,000**, U. Lall (PI), T. Heikkila, V. Modi, J. Sachs (co-PIs), 1/01/08-5/31/10.
 27. *Sustainable Development of Water Resources in Ethiopia: Learning from doing in Koraro*, **Pulitzer Foundation, \$690,000**, U. Lall (PI), V. Modi, F. Montalto, P. Schlosser, P. Culligan (co-PIs), 7/01/07-10/31/11
 28. *Climate-Informed Adaptive Management and Planning to Meet Urban Water Supply and Flood Mitigation Goals in the Delaware River Basin*, **NOAA, \$299,842**, G. Gong (PI), C. Brown, P. Kolesar and U. Lall (co-PIs), 7/01/07-6/31/09

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29. *Water Security in Asia: Meeting the Challenge through Infrastructure Development & Climate Risk Management*, **Asian Development Bank**, **\$180,000**, J. Sachs (PI), C. Brown, T. Heikkila, U. Lall and T. Siegfried (co-PIs), 7/01/07-12/31/08
 30. *Climate and Weather Scenario Driven Strategies for the Adaptive Management of Everglades National Park Operations to Achieve Hydrologic and Ecologic Restoration Targets*, **National Park Service**, **\$498,000**, U. Lall (PI), 4/05 to 4/08.
 31. *Reforming Undergraduate Education in Environmental Engineering: Urban Studios as Knowledge Delivery Systems and Vehicles for Service Learning*, **NSF**, **\$999,494**, J. McGourty (PI), M. Castaldi, P. Culligan, G. Gong and U. Lall (co-PIs). 9/15/04-8/31/08
 32. *Impacts of Water Resource Management Choices in Ceará, Brazil: Roles of Streamflow Forecasts, Rainfall Forecasts and Participatory Decision Making*, **NOAA**, **\$445,833**, K. Broad, PI, A. Pfaff and U. Lall, co-PIs, 10/03-9/05.
 33. *Climate Informed Water Resources Management for Ceara*, **FUNCEME**, **\$100,000**, S. Zebiak (PI), U. Lall, K. Broad, A. Pfaff, L. Sun (co-PIs) 9/03-12/04.
 34. *Analysis of climate variations and hydrologic prediction for the Everglades National Park*, **National Park Service**, **\$152,000**, 3/1/2003-2/28/2005. U. Lall (PI)
 35. *Attracting and Retaining Undergraduates to Engineer the Built Environment*, **NSF**, **\$375,000**, 9/1/2002-8/31/2004, U. Lall (PI), M. Garvin, A. Smyth, P. Sommer (co-PIs).
 36. *Climate Change and Variability: Assessment and Prediction for Streamflow in the Hydroquebec Region*, **Hydroquebec**, **\$200,000**, 6/1/2002-5/31/2004.
 37. *A Joint Graduate Program in Applied Mathematics and the Earth and Environmental Sciences*, **NSF**, **\$2,641,325**, L. Polvani (PI), V. de La Pena, U. Lall, D. Phong, M. Visbeck (co-PIs).
 38. *Infrastructure for the Advancement of Hydrologic Science*, **NSF**, **\$ 678,730**, 9/01-8/04, R. C. Bales (PI), J. S. Selker, U. Lall, M. B. Parlange, M. W. Williams, C. J. Duffy (co-PIs).
 39. *Systems Approach to Earth and Environmental Engineering*, **Academic Quality Fund, Columbia Univ.**, **\$380,000**, 6/01-6/04, U. Lall (PI), co-PIs : A. Sobel and M. Spiegelman, P. Sommer, A. Bagtzoglou, P. Duby, A. Gelman, P. Schlosser, P. Somasundran, N. Themelis, R. Versteeg & T. Yegulalp, A. Pfaff, D. Krantz
 40. *Development of a Benchmark Hydroclimatic Data base for N. America*, **NSF**, **\$15,000**, 5/01-4/02. , U. Lall (PI), E. Cook (co-PI).
 41. *Reconstruction of drought and streamflow over the coterminous United States from tree rings, with extensions into Mexico and Canada*, **NSF**, **\$310,947**, 8/00-7/03. , E. Cook (PI), U. Lall (co-PI).
 42. *Interannual and Interdecadal climate variations of floods in the Western United States*, **NSF**, **\$262,227**, 11/99-11/04, U. Lall (PI), B. Rajagopalan (co-PI).
 43. *Atlantic Basin Tropical Cyclones: Risk assessment using climate indicators*, **NOAA**, **\$125,689**, 9/99-9/01, Y. Kushnir (PI), B. Rajagopalan and U. Lall (co-PIs).
 44. *Devils Lake, N. Dakota- Climate Connections and Forecasts*, **USACE**, **\$12,000**, 1/99-2/00. U. Lall (PI)
 45. *Seasonal To Interannual Ensemble Streamflow Forecasts For Improved Sydney Water Supply Management*, **Sydney Water**, **AU\$90,000**, 2/98-11/98, A. Sharma (PI), U. Lall and I. Cordery (co-PIs).
 46. *Development Of A User Driven Decision Support System For Water Availability And Quality Management*, **DOE-INEEL**, **\$2.38 million**, 1/98-9/02, U. Lall (PI), D Stevens, Q Weninger, T Glover, J Kaluarachchi, D Tarboton co-PIs

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47. *The Changing Seasons? Detecting and Understanding Climatic Change*, **NSF, \$264,000**, 9/97-9/03, U. Lall (PI), B. Rajagopalan, M. Cane, M. Mann and J. Park (co-PIs).
 48. *Droughts in the Southwest and Large Scale Climate: Inferences and Prediction using Nonparametric Statistical Methods with Tree Ring and Historical Climate Data*, **NOAA Earth System History, \$219,400**, 9/97-1/01, E. Cook (PI), B. Rajagopalan, B. Ray and U. Lall (co-PIs).
 49. *Nonlinear Time Series Methods for Forecasting Yakima River Flows*, **U.S. Bureau of Reclamation, \$93,600**, 4/97-12/00, U. Lall (PI).
 50. *Field Investigations into Infiltration and Runoff Under Extreme Rainfall*, **Utah Division of Water Resources, \$25,000**, 1/96 -12/98, U. Lall (PI).
 51. *Nonlinear Dynamics of Streamflow: Classification, Predictability and Forecasting*, **NSF, \$212,000**, 7/95 to 7/98, U. Lall and H.D. I. Abarbanel (PIs).
 52. *Assessing Aquifer Heterogeneity and Groundwater Contamination Potential: Data, Methods and Utah Applications*, **USGS, \$122,000**, 7/94 to 7/96, U. Lall (PI).
 53. *Site Subsurface Characterization at Hill A.F. Base*, **U.S.A.F., \$7,200**, 6/94 to 10/94, U. Lall (PI).
 54. *Non-Parametric Stochastic Simulation Of Streamflow In The Colorado River*, **USGS, \$189,000**, 10/92 to 9/95, D. Tarboton (PI), U. Lall (co-PI).
 55. *Predictability And Variability Of Climate And Hydrology: Inferences From Great Salt Lake Dynamics*, **USGS, \$185,447**, 10/92 to 8/95, U. Lall (PI).
 56. *The Dynamics of Closed Basin Hydrology and Climate Variability*, **NSF, \$104,000**, 10/92 to 4/95, U. Lall (PI).
 57. *Subsurface Characterization Using Drill Log Data*, **Utah Division of Water Rights, \$5,500**, 6/92 to 6/93, U. Lall (PI).
 58. *Sharon Steel Groundwater Contamination Investigations and Remediation Design*, **Utah Division of Environmental Health, \$30,000**, 12/90-12/91, U. Lall (PI), M. W. Kemblowski, G. Urroz (co-PIs).
 59. *Kennecott Tailings - Groundwater Remediation And Natural Resource Damage Assessment*, **Utah Division of Environmental Health, \$30,000**, 10/90-6/91, U. Lall, (PI), L. D. James, M. W. Kemblowski (co-PIs).
 60. *Evaluation of hydraulic interconnections in heterogeneous multi-aquifer systems*, **USGS, \$74,900**, 9/90-9/92, M. W. Kemblowski (PI), U. Lall (co-PI).
 61. *Climatic variability and hydrology, inferences from the dynamics of the Great Salt Lake*, **Utah Mineral Lease Funds, \$13,133**, 7/90-7/91, U. Lall (PI).
 62. *Sharon Steel Groundwater Investigations*, **Utah Division of Environmental Health, \$30,500**, 4/90-12/90, M. W. Kemblowski (PI), U. Lall, G. Urroz (co-PIs).
 63. *Development of a mountain climate generator*, **U.S. Forest Service, \$800,000**, 9/89-12/95, D.S. Bowles (PI), G. Bingham, U. Lall, D. Tarboton (co-PIs).
 64. *Estimation of the space and time variability of non-point source ground water contamination*, **USGS, \$262,262**, 9/89-9/91, U. Lall (PI), K. Bosworth (co-PI).
 65. *Robust, efficient estimation and prediction of groundwater quality in Salt Lake County*, **Utah Mineral Lease Funds, \$18,585**, 7/89-7/91, U. Lall (PI).
 66. *Anaerobic Biotransformation and fate of heterogeneous organic pollutants in groundwater*, **USGS, \$109,500**, 7/88-7/90, S. Ghosh (PI), D. Schamber & U. Lall (co-PIs).
 67. *Parameter Estimation Models for Stream Drainage Systems*, **Utah Division of Water Rights, \$9,200**, 4/85 - 3/86, U. Lall (PI).

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68. *Strategies for the Conjunctive Management of Ground and Surface Waters*, **U.S. Bureau of Reclamation, \$122,000**, 9/84-9/87, U. Lall (PI).
 69. *Optimization Models for Multi-Reservoir Systems with Lower Bear River Basin Applications*, **Utah Div. of Water Resources, \$9,900**, 5/84 - 2/85, U. Lall (PI).
 70. *A Bilevel Optimization Model for Integrating Fare and Service Structures to Minimize Urban Transit Operation Deficits*, **Urban Mass Transit Authority, \$96,703**, 8/83 - 2/85, J.C. Yu (PI), U. Lall (co-PI).
 71. *Optimization Model for Conjunctive Regional Water Resource Development*, **University of Utah Research Committee, \$3,070**, 1/83-1/85, U. Lall (PI).

Other Information

Professional Service

Participation in several NRC panels: Climate and Water Cycle; Flood Risks in the American River; Estimating and Communicating Uncertainty in Weather and Climate Forecasts; Committee on Preparing for the Third Decade (Cycle 3) of the National Water-Quality Assessment (NAWQA) Program; Modeling and uncertainty analysis for the restoration of the Everglades, Florida

Member Advisory Committee on Environmental Research and Education to the Director, the National Science Foundation

Member NSF Working Group on Water, Earth and Bios. 1995-1999

Moderator for President's Regional panel on global climate change. 1997

President of the Natural Hazards Focus Group of the American Geophysical Union 2015-2016

Member World Economic Forum, Global Agenda Council on Water 2009-2011

Contributor to the IPCC, and Lead Author of the Water Chapter for the 2018 US National Climate Assessment

Selected Invited talks and Keynotes at non-academic public events: World Bank, Stockholm Water Week, Singapore Water Week, American Water Intelligence, Water 2.0, NY Academy of Science, World Leaders Forum, UN World Water Forum; Shell Water-Energy Summit, American Water Summit, EU General Assembly, Sustainalytics, US Water Partnership, Rubin Museum, Water Innovations Alliance Foundation; American Water Summit; Financial Times Event on Water; Circle of Blue Webinars on Choke Point USA, Mining and Water; Water and Climate; Woodrow Wilson Center; USAID; Municipal Analysts Group of New York; CERES Investor Water hub; Interfaith Center on Corporate Responsibility; OECD-FICCI-ADB-2030WRG Seminar on Water Risk and Stewardship; NOAA MAPP; White House Water Forum; World Bank Water Week; Natural Conservancy Global Water Summit; Pro Publica-New America; several water and climate related movie screenings

Interviews: World Economic Forum, European Commission; Cathedral Church of Saint John the Divine; GOOD; CBS Marketwatch; Statistics Views; Business Insider; CSR Wire; Bloomberg News; The McBride Network; Crains New York; Environment & Energy News; Circle of Blue; Big Think; Huffington Post; Vice.com; Growing Blue; RWL Water; Pub Publica Press – FACE HD; The Guardian; Reuters, Xinhua News Agency; Economist, National Geographic, The Atlantic Magazine, Financial Times, NY Times, Washington Post, USA Today, Desert Sun; Asian Development Bank magazine, Christian Science Monitor; Times of India, The Hindu, The Tribune, Popular Science; GE Reports; Nature News

CBS, ABC News, CNN, PBS, NPR, BBC, WNYC, WNBC, Mundo TV, Rede Globo, Al Jazeera, ARISE TV, R-TV America; Interview for WLIW Documentary: Plagues and Perils of Salton Sea Earthsky.org; Namibia Press Agency ; Apocalypse Now; National Public Radio, Here & Now;

Corporate Advisory Boards: Xylem, Waterfund, Ketos

Editor in Chief: Water Security, 2016-date

Associate Editor: Water Resources Research, 1993-2002, ASCE J. of Hydrologic Engineering, 1994-2004.

Reviewer: Water Resources Research, Journal of Hydrology, Water Resources Bulletin, ASCE J. of Water Res. Plng. & Mgmt, ASCE J. of Hydraulics, Advances in Water Resources, Stochastic Hydrology & Hydraulics, Nordic Hydrology, J. of Computational and Graphical Statistics, Nature, Science, Environmental Research Letters, Geophysical Research Letters, Computational Statistics, Communications in Statistics, Journal of Climate, Hydrology & Earth System Science, Journal of Geophysical Research, NSF, USGS, DOE, NIGEC, EPA, NASA, NOAA. Served on NASA, NSF, EPA, and NOAA Review Panels.

Society Memberships

Societies and Committees: Member AGU, ASCE, AAAS. Committee Involvement with AGU and ASCE. President (past): AGU Natural Hazards Section
Member (past): Board of Directors, UCOWR and CUAHSI.

University Service

Administrative: Associate Director of Utah Water Research Laboratory; Chair, Department of Earth and Environmental Engineering, Columbia University. Chair, Civil Eng & Eng Mechanics, Director, Columbia Water Center, Associate Director, Applied Statistics Center

Committees: Participated in and chaired department, college and University committees for tenure and promotion, computer programs and labs, curricula, faculty search, undergraduate admissions, student affairs, research and development, PhD Qualifying exams, graduate theses, CAD/CAM, department Goals, directed Graduate Studies Program for Civil Eng..

Consulting

Clients include: R&M Consultants, Soldier Creek Coal Co., Coop Mining Co., Technical Advisory Service for Attorneys, Utah Division of Water Rights, Utah Division of Water Resources, Eckhoff, Watson & Praetor, UINTEX, U.S.G.S., Utah Division of Environmental Health, Keller-Bliesner Eng., Jason Associates, IWMI, U.S.B.R., FUNCEME, S. Florida Water Management District, Hazen and Sawyer, Tampa Bay Water, World Bank, UTE (Uruguay).

Project Areas Include: Geohydrology and Contaminant Transport, Flood Frequency Analysis and Control, Drainage, Mine Hydrology, Risk and Environmental Impact Assessment, Reservoir and Streamflow Analysis, Aquifer Management, Coal and Copper Mine Reclamation, Landfill/Incinerator site geo-hydrology evaluation, Stochastic Hydrology and Spatial Analysis, Stream network mass balances, Spatial interpolation, Climate Model Downscaling and Hydroclimatology, Climate Risk Analyses in support of Insurance products, Financial Instruments design for hedging climate risk for water and energy utilities.