COMPUTING & ENVIRONMENT FRONTIERS

Hong-Yi Li, Ph.D.

Ph.D. – University of Illinois at Urbana-Champaign
Assistant Professor, Civil and Environmental Engineering

Selected Publications

1. Zhang, X., Li, H.-Y., Leung, L. R., Liu, L., Hejazi, M. I., Forman, B. A., & Yigzaw, W. (2020). River regulation alleviates the impacts of climate change on U.S. thermoelectricity production. Journal of Geophysical Research: Atmospheres, 125, e2019JD031618. https://doi.org/10.1029/2019JD031618.

2. Yigzaw, W., Li, H.-Y., Fang, X., Leung, L. R., Voisin, N., Hejazi, M. I., & Demissie, Y. (2019). A multilayer reservoir thermal stratification module for earth system models. Journal of Advances in Modeling Earth Systems, 11, 3265–3283. https://doi.org/10.1029/2019MS001632.

3. Yigzaw, W., Li, H.-Y., Demissie, Y., Hejazi, M. I., Leung, L. R., Voisin, N., and Payn, R. 2018. A New Global Storage-Area-Depth Dataset for Modeling Reservoirs in Land Surface and Earth System Models, Water Res. Res., https://doi.org/10.1029/2017WR022040

4. Wang, W., Li, H.-Y., Leung, L. R., Yigzaw, W., Zhao, J., Lu, H., Deng, Z., Demisie, Y., & Blöschl, G. (2017). Nonlinear filtering effects of reservoirs on flood frequency curves at the regional scale. Water Res. Res., 53. https://doi.org/10.1002/2017WR020871.

5. Liu, L., Hejazi, M. I., Li, H.-Y., Forman, B., and Zhang, X. (2017), Vulnerability of US thermoelectric power generation to climate change when incorporating state-level environmental regulations, Nature Energy, 17109 (2017), doi:10.1038/nenergy.2017.109

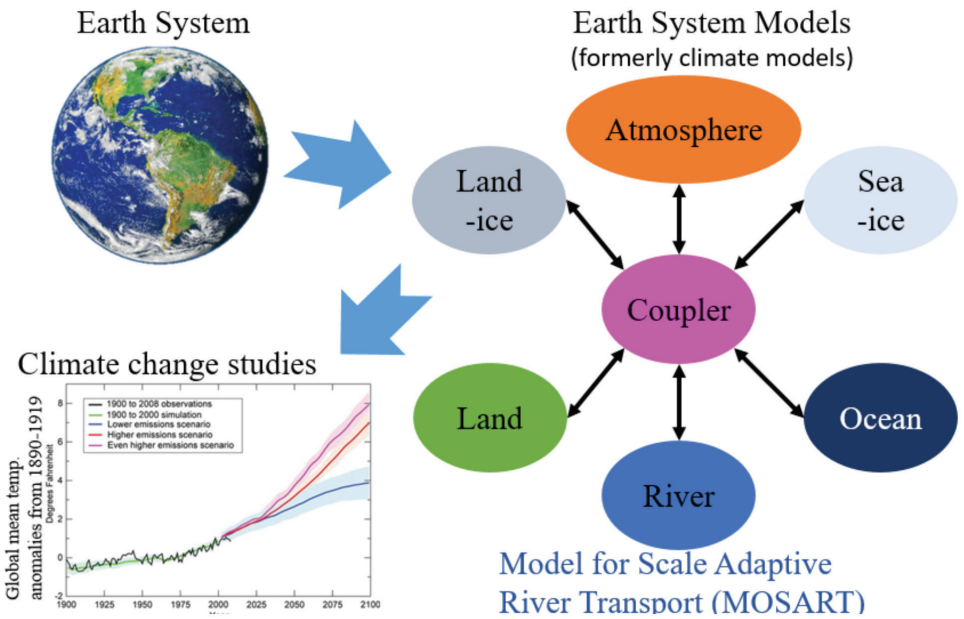
Dr. Li conducts interdisciplinary research that involves surface hydrology and Earth System modeling. Specifically, his research interest centers on developing novel modeling and data analysis tools to investigate, understand and predict water, energy and biogeochemical fluxes across land surface, through river systems and into the ocean.

Since human society is an integral part of the Earth System, Dr. Li is also interested in understanding and representing two-way interactions and feedbacks between human and Earth systems with implications to the climate-water-energy-food-environment nexus. He has published over 60 peer-reviewed journal articles. He currently serves as an associate editor of Water Resources Research (AGU) and Journal of Hydrologic Engineering (ASCE), and as the vice president of International Commission of Water Quality under the International Association of Hydrologic Sciences.

IMPROVING HYDROLOGIC PROCESS REPRESENTATIONS IN EARTH SYSTEM MODEL

Earth System Modeling (ESM) is a primary tool for studying climate change at the regional to global scales. Dr. Li's research improves the predictive capacity of ESMs by helping enhance the representation of hydrologic processes in ESMs.

He has developed a physical-based river module for ESMs also known as Model for Scale Adaptive River Transport (MOSART) that functions as a framework to quantify the relative impacts of climate- and human-induced changes on riverine water and heat and nutrient fluxes at the regional and larger scales. The Exascale Energy Earth System Model (E3SM) sponsored by the US Department of Energy, and the Community Earth System Model (CESM) primarily sponsored by the U.S. National Sciences Foundation via the National Center for Atmospheric Research (NCAR) are the two leading ESMs who have adopted MOSART.



WATER-ENERGY-ECOLOGY NEXUS

Dr. Li also uses ESMs to shed light on the regional dynamics of the Water-Energy-Ecology nexus from an integrated Human-Earth System perspective. Using water as the hub in this nexus, his work has revealed how propagation of climate variability (e.g., droughts) from atmosphere to soil moisture to streamflow is controlled by human activities such as water management and emission mitigation at the regional and global scales. For example, his group has quantified how the resulting changes to the spatio-temporal hydrologic variability propagates to the ecology and energy sectors at the regional scale, impacting the future survival of juvenile salmon in the Columbia River basin and future thermoelectricity production in the United States.