**Abstract:** Recent advances in sensing, computation and communications have created a massive suite of low-cost, low-power, and Internet-connected devices. These sensor systems are now enabling the study of water systems at unprecedented spatiotemporal resolutions. While the resulting real-time data feeds have the potential to fundamentally transform the study and management of water resources, they often merely serve as a convenience to limit field visits and simplify data collection. Rarely are the resulting data part of real-time workflows, analyses and modeling tool chains. To that end, this talk will specifically focus on benefits of real-time water data, which are data that are used as soon as they are collected. Now more than ever, real-time water data are poised to drastically improve scientific experimentation, while simultaneously serving as an unparalleled tool for broader decision making. By coupling the flow of water with the flow of information, modern water systems will be able to make automated decisions based on an intimate knowledge of their states. Through a spectrum of applications, spanning from the water balance and water quality of the Great Lakes, all the way to the control of urban hydraulic systems, I will show that sensor-driven, real-time water systems have the potential to fundamentally revolutionize our study of the interaction between meteorology, hydrologic systems, and man-made infrastructure.