Research Focus
My research team’s activities span from the local scale, by monitoring and modeling stormwater quantity and quality at the Mason main campus with state-of-the-art sensor networks, to the global scale, combining water resources engineering with hydrometeorology and remote sensing using satellite data to evaluate conditions in remote regions, where ground truthing is impossible, but where environmental and health consequences can be devastating.

Current Projects
■ We study surface flux, snow/ice storage, and water balance changes in High Mountain Asia (HMA) and investigate the causality of these changes at the regional to local scale. We are developing a high-resolution Land Data Assimilation System, forced by physically downscaled surface meteorology, parameterized by remotely sensed topography and vegetation, and constrained by remotely sensed snow, temperature, and glacier observations.

■ We develop innovative terrestrial phenology data assimilation techniques to integrate satellite-based vegetation observations into a modeling framework to improve our estimation of hydrological variables globally. A better characterization of terrestrial water, energy, and carbon cycles through the integration of observations into models at spatial and temporal scales conducive to decision making and adaptation responses are essential to socio-ecosystem sustainability.

■ As water in various components of the landscape freezes, its movement is largely curtailed with impacts on climate, hydrology, ecology, and biogeochemical processes. We are exploring the potential of developing a global, high resolution fractional Freeze/Thaw product that moves beyond current binary methods by representing intermediate phases between frozen and thawed states. This includes identifying responses of various types of frozen or thawed ground that can vary temporally, with depth, and widely over varying landscape properties.