



Bayesian Hierarchical Framework for Space-time Modeling of Hydroclimate Variables and Extremes

Prof. Balaji Rajagopalan

Department of Civil, Environmental and Architectural Engineering

& Fellow, CIRES

University of Colorado, Boulder, CO

Wednesday, September 8, 2021 | 11:30 AM | ECCE 1B41 &

Zoom: <https://cuboulder.zoom.us/j/93058839188>

(passcode: water)

Abstract:

Variability of hydroclimate (precipitation, streamflow, temperature etc.) and extremes in space-time pose major natural hazard risk to human life and infrastructure. This risk is exacerbated in developing communities with marginal infrastructure and response capabilities. Thus, robust understanding, modeling and projection of risk is crucial to devise effective hazard mitigation strategies at operational and planning time scales. This requires methods that capture the uncertainties in the hydroclimate process robustly. To this end, Bayesian hierarchical modeling (BHM) framework for modeling hydroclimate variables such as, precipitation, streamflow, and their extremes offer attractive alternatives to traditional frequentist counterparts. Their attraction is their ability to capture uncertainties robustly via posterior distributions, besides, enabling to incorporate qualitative and quantitative information about the underlying processes. In recent past, a suite of BHMs for various hydroclimate applications from several research groups including ours have emerged. Building on these, with my student *Mr. Alvaro Ossandon* and collaborators, we developed novel BHMs for space-time precipitation and streamflow extremes, and Bayesian Hierarchical Network Model for daily streamflow forecasting. This will present these models in the BHM framework via applications to southwest U.S space-time extreme precipitation, extreme seasonal streamflow extremes on the Upper Colorado Basin and, daily streamflow on the Narmada River Basin network, in Western India. These models provide posterior distributions of the hydroclimate variables enabling robust estimates of return levels, which are important for risk assessment and resource management.

Speaker Bio: Professor Balaji Rajagopalan pursues research in diverse interdisciplinary areas spanning – hydro-climatology; water resources management, Indian summer monsoon, paleo-climate and stochastic hydrology. In addition, large scale statistical analysis and modeling for applications to water and wastewater quality, construction safety, building energy efficiency and others. For his research contributing to improved operations, management and planning of water resources in the semi-arid river basins of Western USA, especially the Colorado River System, he was a co-recipient of the *Partners In Conservation Award* from the *Department of Interior* in 2009. His joint work on unraveling the mystery of Indian summer monsoon droughts that appeared in *Science* in 2006 was awarded the prestigious *Norber Gerbier Mumm Award* from the *World Meteorological Organization* in 2009. He was elected *Fellow, American Geophysical Union*, in 2019.