Stochastic Hydrology in the Framework of Climate Variability and Change[1]

José D. Salas[2]
Department of Civil and Environmental Engineering, Colorado State University

Abstract. Simulation and forecasting of hydrological variables such as streamflows have been important components in planning and management studies of water resources systems for several decades. However, in recent years some of the basic models, assumptions, and procedures underlying those operations have been questioned because of concerns related to climate variability and change. In this presentation we will discuss hydrologic variability and change as related to climate variability and change based on stochastic methods. Examples will be provided where climatic processes represented by some indexes such as the Pacific Decadal Oscillation (PDO) and the Atlantic Multidecadal Oscillation (AMO) vary in a quasi random fashion with oscillations resembling cycles and trends. More importantly examples will be shown where variations of precipitation and streamflow reflect those of large scale climatic oscillations. The concepts of stationarity and nonstationarity, the effects of persistence, and alternative short and long memory models that may be useful for describing and simulating the variability and change of hydroclimatic data will be described. The presentation will end with some discussion on the applicability of the various stochastic models and methods given the current concern of climate change.

[1] Based on the 2010 Ven Te Chow Lecture delivered at EWRI/ASCE World Environmental & Water Resources Congress
[2] José D. Salas, M.S., Ph.D.; Professor of Civil and Environmental Engineering. Colorado State University. http://www.engr.colostate.edu/~jsalas/