Investigating critical timescales of water storage and discharge in the Sierra Nevada, California.

Rosanna Neuhausler

California's precipitation has the highest level of year-to-year variability observed in the United States (Dettinger et al 2011). This variability is expected to increase with future climate change. Research finds that the likelihood of the main driver of California's droughts - concentrated high pressure off the state's coast barring moisture from reaching the shoreline - is expected to increase approximately three-fold under climate change (Swain et al 2014). Concurrently, there is an expected increase in the frequency of intense storms during wet years (Gao et al., 2017). In preparation for such events, it becomes important to forecast water storage and release from its various environmental sinks for proper water resource management. However, identification of the appropriate timescales over which such hydrologic processes occur is one of the most salient challenges for modeling storage releases (Benettin et al., 2015; Gibson et al., 2002; McGuire & McDonnell, 2006; McNamara et al., 2011; Skøien et al., 2003). My work looks to address this challenge of distinguishing critical release response times, expanding on previous studies analyzing flow responses in the Sierra Nevada. Godsey et al. have shown Sagehen Creek's low flows exhibit a 'memory effect', in finding a relationship between the low flows during wet years and the previous year's snowpack, in addition to that of the current year (Godsey et al, 2013). I am using statistical techniques from information theory to resolve such critical timescales, for a broader set of variables and over a longer period of time than previously done, to (1) get a better understanding of the various response times of the system to improve forecasting, and (2) analyze how/whether these timescales have been altered by changes to the climate over the past 50 years.

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