DISENTANGLING FLOOD DRIVERS: COASTAL RIVER FLOOD RISK IN A CHANGING CLIMATE

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Return levels, which relate the frequency of an event to the magnitude of an event, are ubiquitous in planning. Flood protection strategies such as levees and seawalls are often built to withstand a 100-yr flood which is assumed to be linked to a meteorologically or hydrologically extreme event. However, in coastal environments, flooding is often driven by compound events, where multiple forcing such as storm surge, tides, and river discharge, combine to drive high water levels. Furthermore, we often assume these events are not changing in time. This is particularly troublesome in urban environments, where design events focused on univariate processes for flood planning may misrepresent the risk to flooding densely developed communities face.

Here we explore the transfer of flood risk in an urban setting due to both compound forcing and adaptation interventions. Our study site, the San Francisquito Creek, flows from the Santa Cruz Mountains into the San Francisco Bay. The San Francisquito Creek runs through five municipalities, all of which have a large variation in wealth, and has been entwined in watershed management issues focused on sedimentation, flood control, and habitat conservation. Local authorities are currently deciding how to best manage sediment which has accumulated at the upstream dam while avoiding an increase in downstream flood threats.

We employ a hybrid modeling technique, which merges probabilistic modeling of flood drivers with numerical modeling of along-river water levels. This technique allows us to simulate thousands of high water level scenarios over various implementations of flood protection measures and river channel sedimentation to identify the dominate drivers of flood risk. Overall, our research quantifies the uncertainty in flood events by characterizing the climatic, morphologic, and human driven processes that alter design water levels in a changing climate.

PRESENTER BIO: Dr. Serafin is an assistant professor in the Department of Geography at the University of Florida. Her research focuses on understanding the frequency, drivers, and impacts of coastal flooding and erosion events to evaluate the risk and resilience of coastal settings to present day and future hazards.