Nelson Tull

Quantifying Hydrological Connectivity in the Trinity River Delta.

__Abstract:__ This study combined field data collection and numerical modeling to understand the mechanisms of flow exchange between the lower Trinity River and its floodplain. We performed three field campaigns, in May 2022, October 2022, and April 2023 during medium, low, and high flow conditions, respectively. For each campaign, we took river discharge measurements to see where flow was moving between the river and floodplain. We quantified the flow rates moving through many large floodplain channels and demonstrated that these channels are important conduits for river-floodplain exchange and delta flow circulation at all discharges. We calibrated a numerical hydrodynamic model using the collected discharge data and USGS streamflow data from gaging stations in the area, and used the model to quantify how surface-water connectivity between the river and floodplain changes as the river approaches the coast and as discharge increases from sub-bankfull to bankfull. We then coupled a passive tracer model to our hydrodynamic model to discover which river bends and floodplain channels convey the largest river-floodplain fluxes. We emphasized the complex ways in which river water can move to and from the floodplain, both through individual floodplain channels and also across local river banks that lie unbounded by natural levees. Model results and the ADCP data both illustrated the importance of the topographic bluffs that constrict the floodplain at three distinct locations within the study area. Floodplain flow volumes and fluxes alternated in magnitude based on proximity to the bluffs, as flow is forced to re-enter the river upstream of each bluff. The data and results from this study provide insight into the important natural and human-made features of the lower Trinity River system that influence flow hydraulics, water resources, and ecological processes near Trinity Bay. This study was funded by the Texas Water Development Board for the purpose of studying environmental flow needs for Texas rivers and estuaries as part of the adaptive management phase of the Senate Bill 3 process for environmental flows established by the 80th Texas Legislature (TWDB Contract #2000012435).

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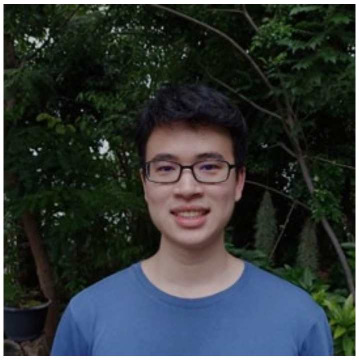
Chayanon Wichitrnithed

Development of a Hurricane Storm Surge and River Runoff Model for the Texas Coast



__Abstract:__ Several recent hurricane events on the U.S. Gulf Coast have seen extensive rainfall and corresponding runoff and flooding. Hence, these events lead to compound flooding in which surge from the coastal ocean interacts with rainfall and runoff in rivers. Simulating these events is particularly challenging as the interaction between the flooding processes is highly nonlinear thereby negating the validity of superposition. The goals of this study are to create a finite element mesh that can accurately represent rivers and floodplains on the Texas coast, simulate different scenarios of compound flooding using historical storm data, and locate the transitional zone where storm surge interacts with runoff. This study was funded by the Texas Water Development Board for the purpose of advancing the agency's flood science, mapping, and modeling initiatives (TWDB Contract #2201792620).

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