Environmental and Water Resources Engineering, and the Center for Water and the Environment Seminar Series Presents:

Thursday, February 20th 2025, 3:30-4:30pm, ECJ 1.324

Zoom Link: https://utexas.zoom.us/j/94105241294

Biodegradability of Dissolved Pyrogenic Organic Matter in Aquatic Systems to Elucidate Wildfire Effect on Biogeochemical Cycling, Microbial Community and Ecosystem Function

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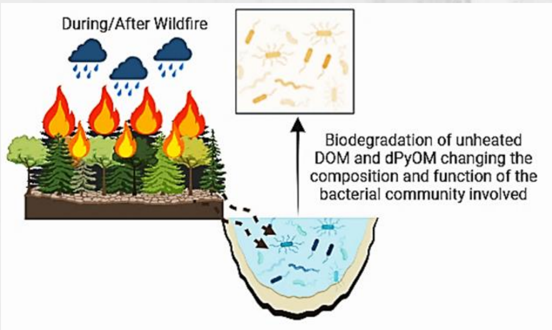
Advisor: Dr. Courtney Gardner



Wildfires produce partially combusted organic matter, which is mobilized into aquatic systems as dissolved pyrogenic organic matter (dPyOM) during post-fire rainfall events. Once introduced into freshwater ecosystems, dPyOM can influence microbial activity, nutrient cycling, and overall water quality. This presentation will explore the biodegradability of dPyOM, focusing on how combustion temperature affects microbial degradation, community composition, and nitrogen cycling. Understanding these processes is essential for predicting the long-term impacts of wildfires on aquatic biogeochemistry and ecosystem function. By examining microbial interactions with dPyOM, this research sheds light on the resilience of freshwater systems to fire-driven disturbances. The findings have important implications for water quality management, wildfire impact mitigation strategies, and ecosystem recovery efforts, providing valuable insights for researchers, policymakers, and environmental managers.

Efficient Coastal Flood-Inundation Mapping Using Machine Learning-Enhanced Static Model

Armando Santos

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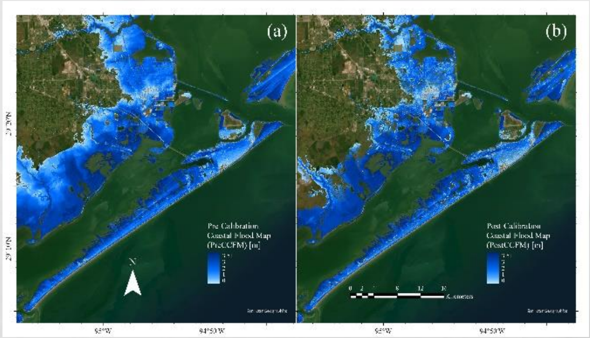
Advisor: Dr. Jun-Whan Lee

The increasing frequency and intensity of tropical storms, driven by climate change, have heightened the vulnerability of coastal regions, endangering lives, infrastructure, and ecosystems. To mitigate these risks, rapid and accurate hazard simulation models are needed to produce coastal flood inundation maps using real-time data. Traditional high-fidelity hydrodynamic models, while precise, are computationally intensive, making them less suited for real-time applications. In contrast, static models are computationally efficient; however, they tend to overestimate flood extents by applying uniform or spatially varying water levels across landscapes and comparing them to topographical features and bathymetry. To address this issue, we improved a static coastal flood model that utilizes water level data from coastal gauges and high-resolution digital elevation models by applying Bayesian optimization, a machine learning algorithm, as part of a calibration process. This calibration integrates land cover data and high-water marks from historical storm events to generate reduction factors used to adjust flood extents post-calibration. The results show that our enhanced model significantly increased the precision of flood extent predictions by 8 percentage points compared to pre-calibration results, as validated against a physics-based numerical model (Super-Fast Inundation of Coasts; SFINCS) using Hurricane Ike as a case study. This approach maintains the computational speed necessary for real-time applications. Moreover, it offers a powerful tool for hazard simulation and emergency response planning in coastal regions.



EWRE Seminar Committee Members: Becky Cantrell, Abby Chapman, Connor Coolidge, Hiromu Koyama, and Azalea Norwood
Supervising Faculty: Dr. Lina Sela