2D Hydrodynamic Modeling for Flood Risk in Baltimore, MD

Julia Atayi, Xin Zhou, & James Hunter
Department of Civil and Environmental Engineering, Morgan State University, Baltimore, MD, USA.

1 Introduction

- Urban flood modeling is essential for understanding and mitigating stormwater impacts in densely populated areas.
- This study examines specific watersheds in Baltimore City, which face challenges like poverty, limited social and economic opportunities, and chronic pluvial flooding.
- Urban flooding in Baltimore often overwhelms drainage systems, leading to surface water accumulation, property damage, traffic disruptions, and health hazards.
- Low-lying areas, frequent intense rainfall, and poor drainage increase flood risks, and can be compounded by nuisance flooding from nearby water bodies, posing significant risks to residents and local businesses.

2 Research Question

- ***How can advanced flood modeling techniques, combined with crowdsourced data, improve the accuracy of predicting urban pluvial flooding in low-lying, socio-economically vulnerable areas of Baltimore???***

3 Methodology

- For the purpose of simulating pluvial flooding in these urban watersheds and analyzing flood depths and major flow paths, the study employed the City Catchment Analysis Tool (CityCAT), a 2D hydrodynamic model.

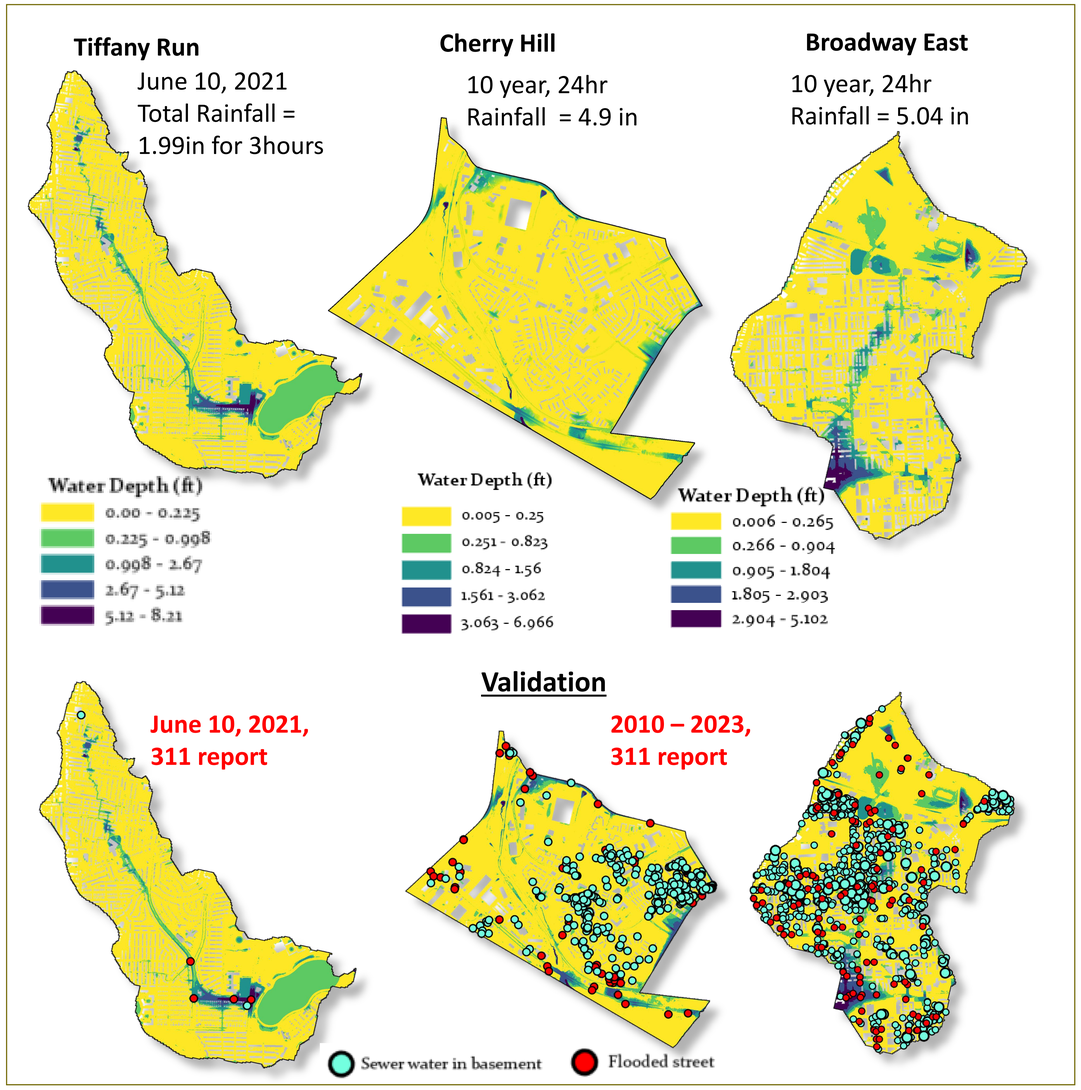
Data Acquisition	Digital Terrain Model	Building shp file	Soil data	Historical Rainfall		
Data Analysis	Green Ampt Method	Building Hole Approach	2D Shallow Water Equation			
Validation	Twitter	Instagram	Facebook	Newsletters	311	911

- High-resolution datasets, including a Digital Terrain Model (DTM) and precipitation data from hydronexrad and local rain gauges, were incorporated into the model.
- For the Tiffany Run watershed, an event-based model was run for a June 10, 2021, storm, while a 10-year design storm was applied to the Cherry Hill and Broadway East watersheds.
- Model validation was achieved using crowdsourced data from 311 and 911 calls, social media, and news reports.

6 Acknowledgement

This research was supported by funding from the U.S. Department of Energy, Office of Biological and Environmental Research (BER), under Award No. DE-SC0023217.

4 Results



5 Conclusion & Future Work

Conclusion

- This study highlights the importance of urban flood modeling to identify flood risks in low-lying areas of Baltimore City, where poor drainage and intense rainfall exacerbate flooding.
- Using the CityCAT model, the research simulated pluvial flooding and identified key flood depths and flow paths, validated by crowdsourced data.
- The findings provide critical insights for developing flood mitigation strategies, including green and gray infrastructure, to reduce future risks.

Future Work