Urban Water Innovation Network

Transitioning toward sustainable urban water systems

National Science Foundation
WHERE DISCOVERIES BEGIN

Project B2-2a
Flood Hydrology and Rainfall Frequency

PROJECT OUTPUTS

This effort is fundamentally linked to project B2-2b, which addresses the interactions between flood flows and urban channels, floodplains and riparian zones as influenced by urban infrastructure and efforts to mitigate impacts of urban development (green infrastructure (GI) and low impact development (LID)) on flood response and other environmental consequences in UWIN study locations.

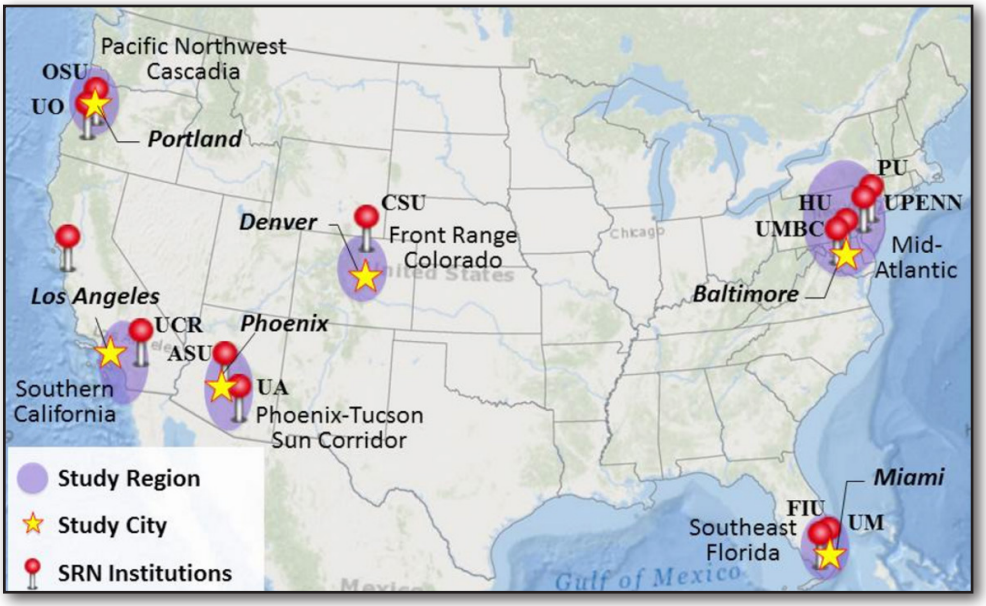
DATA

This project will produce high-resolution radar rainfall fields for the six study regions that can serve as the basis for hydrologic modeling studies and hydroclimatological studies of rainfall and flood frequency.

The objective of this study is to develop a predictive understanding of urban flood hydrology that can be used to assess the effectiveness of urban water solutions, especially Green Infrastructure technologies, in reducing flood hazards.

In this project, we will examine the hydrology, hydrometeorology and hydroclimatology of urban flooding through numerical modeling and data-driven studies that focus on urban watersheds in Baltimore, Miami, Denver, Phoenix (and the broader Sun Corridor region), Los Angeles and Portland.

We will develop long-term, high-resolution radar rainfall fields for each of the six urban regions for hydrologic modeling studies and for examining the hydroclimatology of urban flash flooding. In previous studies, it has been shown that high-resolution radar rainfall fields provide an exceptional resource for assessing urban flooding.



The six urban study regions provide a broad range of settings for examining urban flooding, both in terms of land surface process and in terms of rainfall climatology. We will develop and implement hydrologic models for each of the study regions. Modeling analyses will be used to address core scientific questions and assess the effectiveness of urban water solutions in reducing flood hazards.

HYDROLOGIC MODELS

We will develop hydrologic models that can be used for examining the consequences of urban water solutions (especially those based on Green Infrastructure technologies) and climate change. We will develop stochastic storm transposition models for assessing rainfall and flood frequency in urban watersheds.

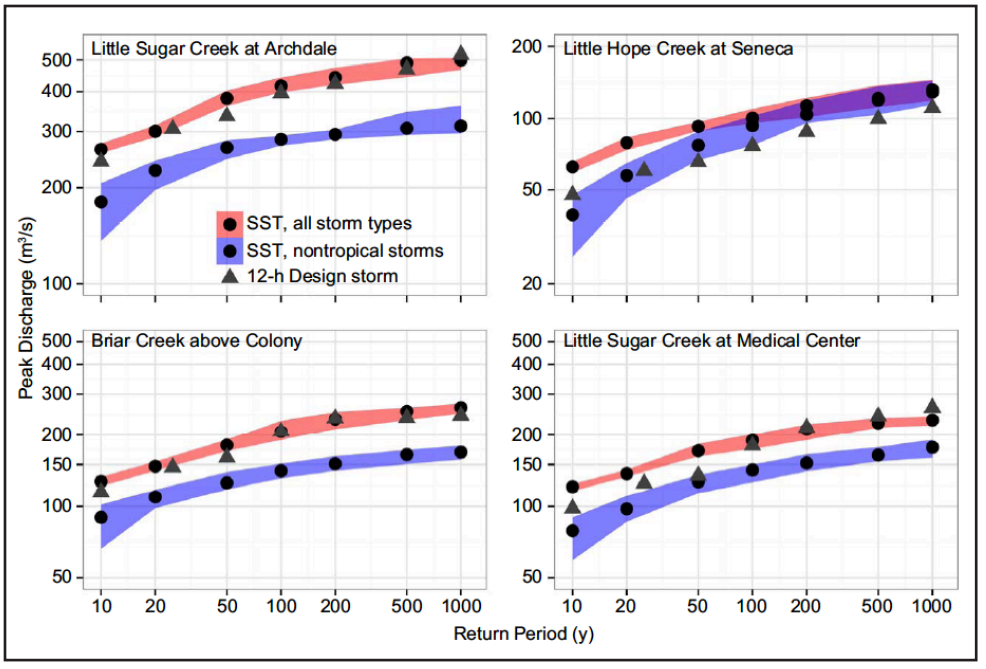


Figure 1: Rainfall frequency analyses for urban watersheds in Charlotte, NC based on Stochastic Storm Transposition applied to catalog of high-resolution radar rainfall fields.

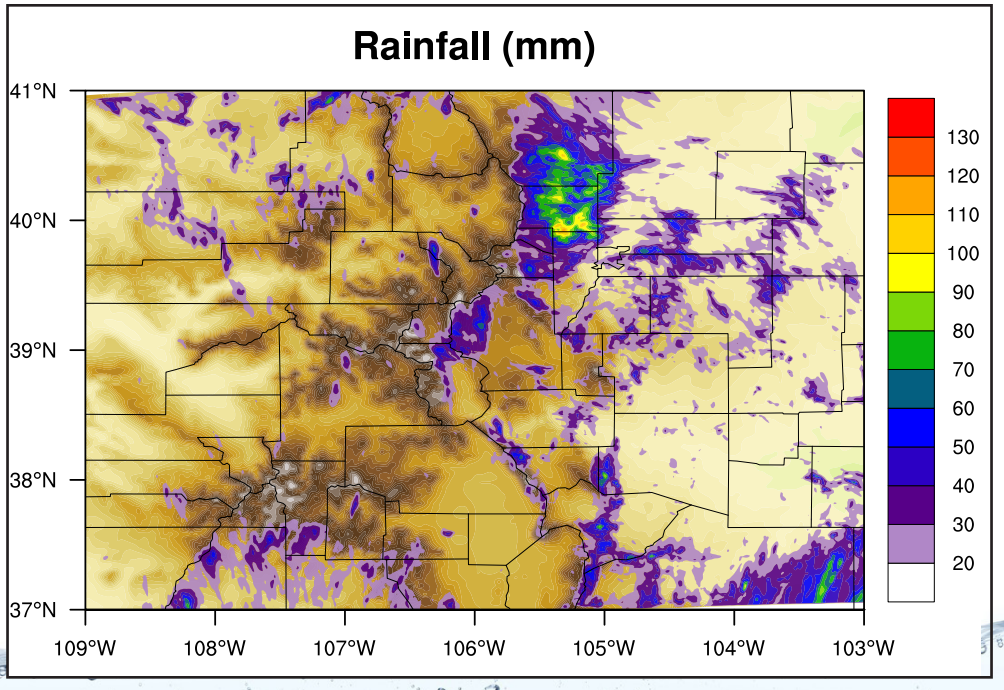


Figure 2: Regional climate model simulation of rainfall from the September 2013 Front Range storms.

PROJECT DELIVERABLES

The experimental approach will center on:

- Development of high-resolution radar rainfall fields for the six urban regions
- Development and implementation of hydrologic models for gaged watersheds in the six urban regions
- Hydroclimatological studies of urban flooding in the six urban regions.

PROJECT KEYWORDS

- Hyrdologic Models
- Urban Flooding
- Sustainability
- Urban Planning
- Storm Transposition
- Rainfall and Flood Frequency
- Flood Hazard Reduction

PROJECT CONTACT

James Smith
Princeton University
Civil & Environmental Engineering
(609) 258-4615
jsmith@princeton.edu
https://erams.com/UWIN/b2-2a/

National Science Foundation
WHERE DISCOVERIES BEGIN

UWIN
www.UWIN.colostate.edu